Journal of the Society of Chemical Industry.

No. 4, Vol. XXXIV. FEBRUARY 27, 1915. No. 4, Vol. XXXIV.

Sydney Section.

Meeting held at Sydney on Wednesday, November 18th, 1914.

PROF. C. E. FAWSITT IN THE CHAIR.

THE USE OF FLUE GAS FOR FIRE EXTINCTION AND FUMIGATION.

BY GEORGE HARKER, D.SC.

The principles underlying the extinction of flames by gases have been clearly set forth by Clowes and Feilmann in two papers published about 20 years ago. The first paper (this Journal, 1894, 13, 1155) describes experiments carried out with the object of ascertaining the minimum proportions of carbon dioxide and nitrogen which would extinguish the flames of various combustible liquids and gases. The second paper (1895, 14, 345) gives the result of further experiments in which the composition of the residual atmospheres produced by the flames was investigated when the flames were allowed to extinguish themselves in a confined volume of air. These results, which confirmed those obtained in the previous experiments, are set forth in the annexed table:—

Composition of the residual atmosphere produced by flames.

Substance burnt.	Composition of residual atmosphere in which flame was extinguished.		
	O_2.	N_2.	CO_2.
	%	%	%
Alcohol	14·9	80·7	4·35
Methylated spirit	15·6	80·2	4·15
Paraffin oil	16·6	80·4	3·0
Colza and paraffin	16·4	80·5	3·1
Candles	13·7	81·1	3·2
Hydrogen	5·5	94·5	—
Carbon monoxide	13·4	74·4	12·2
Methane	15·6	82·1	2·3
Coal gas	11·4	83·7	4·9

It will be seen that the wick-fed flames, *i.e.*, the flames of the substances which make their own gas, are all extinguished when the proportion of oxygen falls to 15%, the percentage of carbon dioxide being from 3 to 5%. A coal gas flame goes out when the oxygen falls to 11·4% in spite of the fact that coal gas contains so large a proportion of hydrogen.

These results are of the highest importance from the point of view of the prevention and extinction of fire, and it follows from them that no fire can live in an enclosed space provided the ratio of oxygen to other gases present can be reduced below a certain minimum. It is also evident that a considerable proportion of oxygen can be present in a fire-extinctive atmosphere. In practice, the means employed to bring about this extinctive atmosphere consists in displacing the air in the enclosed space, either in whole or part, by some gas or vapour which is not itself a supporter of combustion. On shipboard, steam, carbon dioxide, and the gas from burning sulphur are applied for the purpose.

The difficulty in extinguishing basement fires and fire in ships' holds is well known. When water is used great damage is generally done to the goods contained in the spaces. Many ships' cargoes retard the percolation of water, for example, coal, grain, cotton, wool, and jute. The application of water is, therefore, not only uncertain but may be dangerous if the conditions are favourable to the production of water-gas.

Steam is not a good extinguisher of fire, because it condenses readily and cannot therefore drive the air from a packed hold, unless supplied in such large quantity that the temperature of the whole cargo is raised considerably.

Fire extinctive gases are generally supplied on shipboard from a central plant situated in the engine room through pipes leading to the various holds. The capacity of these installations is sometimes based on the assumption that sufficient fire extinctive gas must be added to reduce the contained oxygen to 15% or some lower figure in order to render it fire extinctive. Much larger volumes must, however, be at disposal because, in the first place, the hold cannot be made gas-tight, and requires continued addition of gas to maintain the fire extinctive atmosphere, and secondly, because the heat must be removed from a hot mass of material even after combustion has been arrested before air can be admitted. As the specific heat of gases is very low, this cooling process takes time, and consequently to deal effectively with a fire in an enclosed space, it is essential that there should be at disposal a large volume of fire extinctive gas so that it may be supplied in a continuous stream of sufficient volume, which will not only render the atmosphere fire-extinctive in the shortest possible time, but will further cool the hot mass and while so doing prevent the ingress of air. The need for having at disposal large volumes of gas is a factor of the greatest importance, which cannot be too strongly insisted upon.

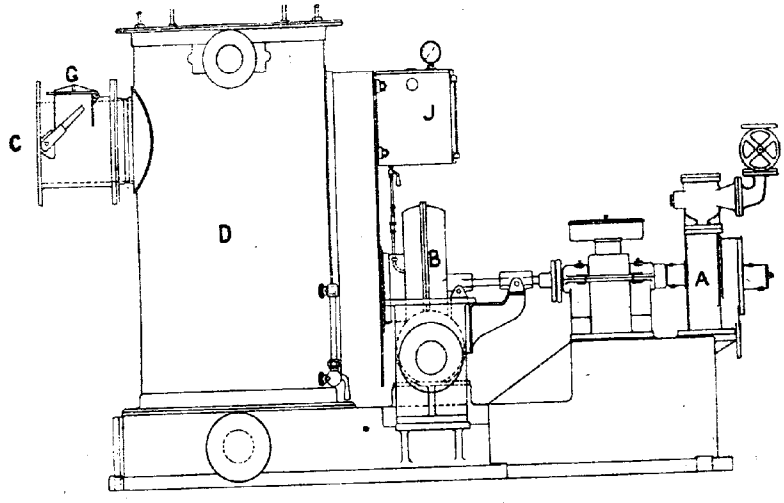
For this reason in particular, the application of the waste gases derived from the combustion of ordinary fuels, has a great advantage, because it makes use of an unlimited supply of gas which is always on hand on any steamship. When coke or coal is burnt in ordinary boiler furnaces, the flue gas contains usually only about 9% of oxygen. About 450,000 cubic feet of this gas are produced from every ton of coal burnt, and it has only to be cleaned and cooled to make it available. In common with other gases used for fire extinction, it is fatal to animal life and therefore provides an excellent means of fumigation. Its lethal action on rats is increased by the small amount (0·25 to 1·0%) of carbon monoxide generally present.

To clean and cool the flue gas an apparatus has been evolved consisting of a machine with a washer and cooler, a fan and steam turbine. By means of this the hot flue gas is drawn from the funnel, thoroughly cleaned and cooled, and then forced to the place of use. As the gas in this state has no germicidal value, means have been provided in certain of the plants now in operation for the introduction of formaldehyde, or other liquid disinfectant, into the stream of gas.

Fig. 1 shows a side elevation of the plant. A is the turbine driving the fan, B. C is a branch connected to the funnel provided with two valves, one opening to the funnel, the other being the valve, G, which can be opened to the atmosphere when the machine is being used for ventilation. D is the washer and cooler through which the gas passes on its way to the fan. The gas is delivered from the fan through the outlet, E. Water from one of the ship's pumps enters the washer at F, and is forced through nozzles and formed into fine

sprays. J is the tank for holding disinfectant liquids, should such be required. Fig. 2 gives a sectional elevation of the gas washer. The gas together with the water in the form of fine sprays passes down the tubes, M, into the spaces, N and O, from which it flows upwards through the spaces, S, being given a circular motion by means of the spiral plate. It then flows down through T and passes through the opening, V, to the fan.

The development of the flue gas process has until recently been very slow. One contributing cause no doubt has been the insistence laid on the need for plants of adequate gas capacity. Furthermore it has been necessary to devote much attention to the improvement of the design of the apparatus, and to find good methods for mixing with the cooled and cleaned gas the vapours of various liquids for disinfecting purposes where such are required.



SIDE ELEVATION.

FIG. 1.

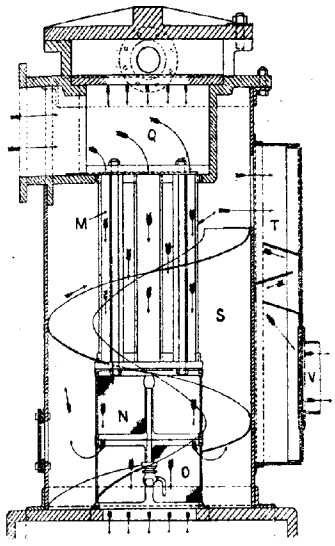
The first complete installation using the flue gas system for fire-extinction and fumigation was placed on a steamer of 4470 gross tonnage belonging to the Colonial Sugar Refining Co., and trading between Australia and Fiji. Besides being always available in case of fire, the plant on this vessel is in continuous use for fumigation, and has proved so satisfactory that another steamer required by the same Company is being provided with a similar installation. The machine is placed near the engine room and draws its supply of flue gas from the funnel through a twelve-inch pipe. By means of two main leads provided with branches, the cooled and cleaned gas is conducted from the machine to the various holds or other compartments of the vessel. The installation delivers 1500 cubic feet of gas per minute to any of the holds, these compartments being each of about 80,000 cubic feet capacity. Allowing for certain losses by diffusion and leakage, an empty hold can be filled with a fire-extinctive or lethal gas in one hour's time. If the hold is filled with cargo, as is generally the case when fumigation operations are being carried out, much less air has to be displaced, and consequently less gas is required. By means of Pitot gauges placed on the main leads, measurements were made of the volume of gas delivered under different conditions to the bottom of the holds, from which it was found that there is comparatively little diminution in the volume of gas delivered into a hold, whether it is filled with cargo or empty. Even with such a close-set cargo as fine opal, 1380 cubic feet of gas per minute were delivered instead of the 1500 cubic feet delivered into the hold when empty. Another series of tests carried out on the same vessel showed that once the atmosphere in a hold was made fire-extinctive, about 500 cubic feet of gas per minute was required to maintain it so, even when the hatches were on and covered by a tarpaulin and all ventilators tightly closed. This gives an idea of the loss of gas which can take place from large holds and the need that exists for installing plants of sufficient gas capacity, where gas is the medium used for fire-extinction. It may be of interest to state that a harbour fire-float is shortly to be equipped with a flue gas plant of large capacity.

The United States Public Health and Marine Hospital Service has adopted the process for its quarantine work, and two of its service steamers have been equipped with the apparatus. In these installations the gases are drawn from the funnel of the steamer, cleaned and cooled, and then delivered through flexible hose to the vessel being fumigated. The percentage of carbon monoxide in these cases is generally from 1% to 1½%, coke being the fuel used. Formaldehyde is added to the gas, being produced from commercial formalin, which is introduced into the current of the gas in the form of a fine spray.

In addition to its cheapness, flue gas has a great advantage in containing no corrosive constituents. Vessels can consequently be fumigated with the cargo in the hold, and this permits of a more effective fumigation than when the cargo is first removed from the vessel and put on shore.

Considerable opposition to the use of flue gas has been met, and it has been frequently stated that the waste gases from the boilers would be useless for dealing with coal fires, as for example, in a ship's bunkers. A plant was recently installed in London for testing purposes, the tests being

carried out by Mr. F. Edwards, with the result that it has been conclusively proved that coal fires are extinguished.



SECTIONAL ELEVATION OF THE GAS WASHER.

FIG. 2.

The result is interesting, because it bears indirectly on the question of the spontaneous combustion of coal and the extinction of coal fires, to which much attention has been directed. When a confined volume of air is left in contact with coal dust, a large proportion of the oxygen will be removed from the air after several days contact. In one experiment with a sample of bituminous Newcastle (N.S.W.) coal, in which a flask was filled with the finely ground coal and left to stand in a room at summer temperature for a fortnight, the gas in the flask on analysis showed only 4·80% of oxygen and less than 1% of carbon dioxide. The conclusion has been drawn by some authorities from experiments such as these, that in order to extinguish a mass of coal on fire, the atmosphere surrounding the coal must be entirely devoid of oxygen. But the absorption of oxygen by the bituminous compounds of the coal is quite a distinct process from the combustion of the coal accompanied by the rapid production of carbon dioxide and water. The difference between slow and rapid combustion is illustrated by the following experiment. Linseed oil placed on strips of paper was found to remove the oxygen completely from a confined volume of air in a flask after two days' exposure, no carbon dioxide being produced. The strips of paper soaked in oil and ignited were extinguished in an atmosphere containing up to 15% of oxygen, *i.e.*, in air from which very little oxygen had been removed. In order to break up the constituents of linseed oil completely with production of carbon dioxide and water, oxidation must take place vigorously, necessitating a high ratio of oxygen in the atmosphere.

In the experiments conducted by Mr. Edwards, in which a large mass of glowing coal was extinguished, the proportion of oxygen in the flue gas was about 9%. Coal when burnt under specially suitable conditions can produce a flue gas containing as low as 4% of oxygen, but, as pointed out by Professor H. E. Armstrong in the discussion on a paper by E. Kilburn Scott,* the application of a gas containing 10% carbon dioxide and only 10% oxygen instead of air with 21% of oxygen immediately slows down the combustion and produces a cooling effect.

The use of cooled flue gas will probably be found of value for the protection of large masses of storage coal, and in fact, its use in this direction is now being seriously considered.

DISCUSSION.

In reply to questions the author said that the percentage of oxygen in flue gas often varied considerably, especially in land installations. The CO_2 sometimes fell as low as 5% but this was only when the boilers were being badly fired. Under ordinary circumstances it was about 10%. The admixture of formaldehyde vapour did not make the gas explosive. Experiments showed that the introduction of carbon bisulphide to the extent of 5 lb. per 1000 c. ft. did not render the gas explosive. If the fires were completely drawn it was estimated the apparatus could be started in about an hour's time; if banked only, in much less time. Steamers in port nearly always kept one boiler under steam and hence a supply of gas was always available. The gas from oil fires was generally lower in oxygen and hence more effective. Tests of the apparatus were made by the U.S. Naval authorities, using boilers fired with oil, and the flue gas was quite effective. In an experimental gas washer arrangements were made for the flow of the gas and water both in the same and in opposite directions. When flowing in opposite directions a considerable resistance to the passage of the gas took place, which interfered with the efficiency of the plant. Boiler flue gas was entirely satisfactory for fumigation work, and hence there was no need for providing a special furnace.

Lecture.

BIOCHEMICAL SYNTHESIS OF GLUCOSIDES AND POLYSACCHARIDES. REVERSIBILITY OF ENZYME REACTIONS. By E. Bourquelot. J. Pharm. Chim., 1914, **10**, 361–375, 393–412.

(ABSTRACT.)

IN the course of the last fifteen years several authors, notably Croft Hill, have suggested that the action of hydrolytic enzymes, such as invertase, is reversible, but until 1911 the evidence in favour of this view was of an indirect nature, for the products of the supposed synthetic actions either were not characterised or were found to be different from what was expected. Researches carried out in the author's laboratory during the past three years have proved definitely that enzymes which hydrolyse glucosides or polysaccharides can reconstruct them from the products of hydrolysis.

Hydrolytic action of enzymes in alcoholic liquids and in indifferent liquids.

In the preparation of tinctures of certain vegetable materials with strong alcohol in the cold, alterations were found to have occurred which

* The use of gases on ships for fire extinction and fumigation. E. Kilburn Scott, Trans. Inst Marine Engineers, Feb. 1913.

could only be attributed to the action of enzymes during extraction (this J., 1911, 1468), and further experiments proved that the activity of enzymes, at least of emulsin and invertase, was much less affected by alcohol than had generally been supposed. The varied activities of emulsin obtained from almonds can only be properly explained by assuming the presence of a number of enzymes, none of which, however, has yet been isolated; one of these (β-glucosidase) hydrolyses certain glucosides, another (lactase) acts on lactose, a third (β-galactosidase) on certain galactosides, and a fourth (gentiobiase) hydrolyses gentiobiose, and so on. It was found that emulsin exerts its hydrolytic action on glucosides not only in dilute methyl or ethyl alcohol, but also in the same alcohols of 70—90% concentration although the enzyme is not soluble therein (this J., 1911, 1468), and even when the emulsin is suspended in acetone or ethyl acetate containing the glucoside and the quantity of water necessary for hydrolysis. Invertase also retains its activity in alcohols, but it is noteworthy that whilst it can act in ethyl alcohol of 90% by volume, it is destroyed by methyl alcohol of 50% by weight (this J., 1913, 434). Similarly the glucosidase of emulsin remains active after several months contact with ethyl alcohol of 90 grms. per 100 c.c., whereas methyl alcohol of the same strength destroys it within a month. The glucosidase of air-dried bottom fermentation yeast (see further) is much more sensitive to the toxic action of alcohols. It is destroyed almost immediately by aqueous solutions containing 34—36 grms. of methyl alcohol, 36—38 grms. of ethyl alcohol, 20—22 grms. of *n*-propyl alcohol, or 6—8 grms. of butyl alcohol per 100 c.c., and slowly by solutions containing 16—18 grms. of methyl alcohol, 20—22 grms. of ethyl alcohol, 16—18 grms. of *n*-propyl alcohol, or 6 grms. of butyl alcohol per 100 c.c.

Synthetic action of enzymes in alcoholic liquids.

β-Alcohol glucosides.—Attempts to synthesise salicin from solutions of saligenin and dextrose in 85% alcohol, by the action of emulsin, gave rise not to the expected product, but to β-ethylglucoside, identical with that obtained in 1901 by Koenigs and Knorr from acetobromodextrose by purely chemical means (this J., 1912, 660). The β-ethylglucoside was obtained much more easily by allowing emulsin to act on a simple solution of dextrose in ethyl alcohol, and within a short time the method was applied to a large number of alcohols. The β-glucosides of the following fatty alcohols were thus prepared:—methyl, ethyl, propyl (this J., 1912, 739), isopropyl, butyl, isobutyl, isoamyl, allyl, geranyl (this J., 1913, 806), glycyl (mono- and di-glucosides), α-hydroxypropyl (monoglucoside) and glyceryl (monoglucoside), besides the following of the aromatic series:—benzyl (this J., 1912, 949), phenylethyl (this J., 1913, 378), cinnamyl (*ibid.*), *o*- and *p*-hydroxybenzyl, *o*-methoxybenzyl, *m*-nitrobenzyl, naphthyl, cyclohexanyl, *o*-methylcyclohexanyl, thymotinyl, and *o*-, *m*-, and *p*-xyleneglycyl (monoglucosides, $C_6H_{11}O_5.O.CH_2.C_6H_4.CH_2OH$). Nearly all these glucosides were isolated in a pure crystalline form. The only one at present known to occur in nature is geranylglucoside, which has been found in *Pelargonium odoratissimum* (this J., 1913, 806). As, however, many alcohols occur in the free state in distillates prepared from plants, they may possibly be derived from the hydrolysis of the corresponding glucosides. In experiments with cetyl, α-naphthyl, ethylphenylglycollic and caprylic alcohols, phenylglycollic nitrile, borneol, morphine, cholesterol, and dimethylethylcarbinol, synthesis was proved by changes in the optical rotation of the solutions, but no attempt was made to isolate the products. The glucosides of solid alcohols, insoluble or nearly insoluble in water, were prepared by using as a solvent acetone mixed with varying proportions of water. Primary alcohols are converted into glucosides more readily than secondary alcohols and the latter more readily than tertiary alcohols. These results indicate that all compounds possessing alcoholic hydroxyl groups combine with dextrose under the influence of emulsin (β-glucosidase), forming β-glucosides, which contain the dextrose in the β-form ($[\alpha]_D = +23°$), and which are lævorotatory like all the natural glucosides hydrolysable by emulsin. The following facts have been ascertained respecting the influence of experimental conditions on the synthetical action of β-glucosidase:—(1) The rapidity of synthesis increases with the quantity of enzyme present. (2) The action is accelerated by rise in temperature provided the limit beyond which the enzyme is injured is not exceeded; whilst operations can be conducted at 30° or even 40° C. with ethyl alcohol, it is not safe to exceed 20° C. with methyl alcohol. (3) For equal concentrations of dextrose the proportion converted into glucoside increases with the alcoholic strength, and when the latter is kept constant the yield of glucoside is raised by increasing the concentration of dextrose up to a limit of 15—20% in 70% alcohol. To prepare β-methylglucoside, 12 grms. of emulsin are added to a solution of 600 grms. of dextrose in 1020 grms. of methyl alcohol and 440 grms. of water. After a month at the ordinary temperatures (16°—19° C.) about 350 grms. of crude glucoside is obtained, which yields about 250 grms. of the pure product. For ethylglucoside it is better to work at 30° C. with alcohol of 90% by volume. A yield of 300 grms. of β-ethylglucoside is obtained in a month from 3 litres of alcohol, 450 grms. of dextrose, and 15 grms. of emulsin.

α-Alcohol glucosides. These differ from the β-glucosides in that they are dextrorotatory, and are not decomposed by emulsin. They correspond to the α-form of dextrose, ($[\alpha]_D = +106°$). They are hydrolysed by an enzyme, α-glucosidase, present in maceration juice prepared from air-dried bottom fermentation beer yeast, and the same enzyme, added to a solution of dextrose in alcohols, effects their synthesis. It is necessary, however, to work with more dilute alcohols than in the case of emulsin (Aubry, this J., 1914, 1112). Methyl- (this J., 1913, 251; Aubry, 1914, 982), ethyl- (*ibid.*), propyl- and allyl-α-glucosides were thus obtained in a pure crystalline form, and α-glyceryl-monoglucoside (this J., 1914, 40) in an amorphous form. Mixed αβ-diglucosides were obtained by acting on α-glycolmonoglucoside with dextrose and emulsin, and on salicin (the β-glucoside of saligenin) with dextrose and α-glucosidase. The α-glucosidase of bottom fermentation yeast is not identical with maltase, for top fermentation yeast ferments maltose and therefore contains maltase, but has no action on α-ethylglucoside (see also Aubry, this J., 1914, 880).

Specific synthetic action of α- and β-glucosidases.—It is well known that in aqueous and alcoholic solutions of dextrose, the α- and β-forms of this sugar ($[\alpha]_D = +106°$ and $+23°$ respectively) are present in certain definite proportions constituting an equilibrium mixture. If α-glucosidase be added to an alcoholic solution it attacks only the α-dextrose, but as fast as this is converted into glucoside there is a partial conversion of β-dextrose into α-dextrose to maintain the original proportion between these forms. Hence the solution behaves towards α-glucosidase as if it contained only α-dextrose, and similarly it behaves towards β-glucosidase as if it contained only β-dextrose (this J., 1914, 706). There is a similar reaction between galactose and α- and β-galactosidases (see below) and probably between all sugars exhibiting mutarotation and the corresponding

enzymes. Each enzyme is restricted in its influence to compounds of the same chemical constitution and stereochemical structure.

β-Alcohol galactosides.—The emulsin of almonds hydrolyses and synthesises not only β-glucosides but β-galactosides, and thus contains a β-galactosidase (this J., 1913, 112; 1914, 706). By the action of emulsin on solutions of galactose in different alcohols, ethyl-, methyl-, propyl-, benzyl-, allyl-, and isobutyl-β-galactosides were prepared, and also the monogalactoside of glycol. A good yield of β-methylgalactoside is obtained by maintaining at 30° C. for 2 months, an aqueous solution of 50 grms. of galactose and 300 grms. of methyl alcohol per litre with 8 grms. of emulsin. Higher concentrations of alcohol injure the enzyme. In the case of ethyl alcohol this is not to be feared, and by using 4—5% solutions of galactose in 80% ethyl alcohol, 69% of the sugar can be converted into galactoside in 7 months at the ordinary temperature. It is best to work at 40° C. and add further quantities of emulsin from time to time as the β-galactosidase is destroyed; at this temperature 53% of the sugar can be made to combine in 15—20 days. All the β-galactosides are lævorotatory and hydrolysable by emulsin. The author discusses the conflicting evidence as to the possible identity of β-galactosidase with lactase (see this J., 1913, 112).

α-Alcohol galactosides.—Infusions of air-dried bottom yeast were found to hydrolyse and synthesise α-methyl- and α-ethyl galactosides, but only very slowly (this J., 1914, 272). The synthetic products are dextrorotatory and hydrolysable by the same infusion of yeast employed to prepare them.

Synthetic action of enzymes in aqueous liquids.

Biochemical synthesis of hexobioses.—Unsuccessful attempts were made to synthesise glucosides of phenols, and also the bioses maltose and sucrose. In the latter cases changes in the optical and reducing properties of the solutions indicated that synthetic reactions had taken place, but it was not possible to isolate or characterise the products. Gentiobiose, a sugar formed by the combination of two molecules of dextrose, and first prepared by the partial decomposition of gentianose, was readily synthesised by the action of gentiobiase, one of the enzymes of emulsin, which also hydrolyses it (this J., 1913, 1086). An extract of almonds was allowed to act on a concentrated solution of dextrose, and after no further change in the optical rotation of the solution occurred, the liquid was boiled and the unaltered dextrose fermented by top fermentation yeast (the necessity for this operation accounts for the lack of success in the attempted synthesis of maltose and sucrose). The liquid was then defecated and concentrated under reduced pressure, and the residue was taken up by 95% alcohol from which the gentiobiose crystallised rapidly after inoculation. Attempts to synthesise a galactobiose by a similar method were only partially successful; an amorphous product was obtained, possessing slight reducing action and small lævorotation, and hydrolysable by dilute sulphuric acid.

Proof of the reversibility of enzyme action.

Various facts indicate that hydrolysis and synthesis are the work of one and the same enzyme, and not of two enzymes existing side by side. The synthetic and the hydrolytic activities of the α-glucosidase of bottom fermentation yeast are destroyed together in aqueous methyl alcohol of more than 34—36%. Emulsin can hydrolyse and synthesise in presence of indifferent solvents such as acetone. The state of equilibrium in alcoholic solutions of sugars is independent of the quantity of enzyme employed, and of the temperature of reaction provided it is not sufficiently high to injure the enzyme. It was further demonstrated for α- and β-ethylglucoside and β-methylglucoside that the same condition of equilibrium is reached from both directions, *i.e.*, whether the original alcoholic solution contained dextrose or an equivalent quantity of glucoside (this J., 1912, 800; 1913, 456, 762); and if two such solutions, so chosen as to be equidistant from the condition of equilibrium, are treated with equal quantities of enzyme at the same time, they will approach the state of equilibrium (one by synthesis, the other by hydrolysis) at exactly equal speeds. This was experimentally verified for β-methylglucoside, by periodic observations of the optical rotation of the solutions.

Fermentative equilibria.

The equilibrium attained by enzyme action in alcoholic solutions of sugars, like ordinary chemical equilibrium in solutions, is the result of two opposed reactions (hydrolysis and synthesis) proceeding at equal rates. The speed of each of these reactions varies with the concentration of the participating substances, and therefore the point of equilibrium is displaced if, for example, sugar is removed (by fermentation) or added to the liquid (this J., 1914, 272). The ratio of combined sugar to that in the free state, corresponding to equilibrium, is designated the "equilibrium ratio." For solutions containing 20 grms. of ethyl alcohol and 1 grm. of (total) dextrose in 100 c.c., it is ·326/·674 in presence of α-glucosidase, and ·234/·766 in presence of β-glucosidase, and these ratios do not change perceptibly for concentrations of dextrose between 1 and 16%. When both enzymes are added to the same solution the quantity of dextrose in the free state when equilibrium has been attained, may be calculated by dividing the total amount of dextrose present, by the sum of the two "equilibrium ratios" increased by 1. This formula was deduced mathematically and verified by experiment. It was further proved that the same final condition is attained whether the second enzyme is added together with the first, or after the latter has produced a state of equilibrium. There can be no doubt that these simple laws regulate the complex and varied phenomena produced by enzyme reactions in living beings.

Conclusions. It is possible by the synthetical action of enzymes to prepare large quantities of certain compounds. The better known enzymes will become most valuable guides in the study of chemical processes in living organisms. Dextrose exists in all plants, and if an enzyme capable of decomposing glucosides is found in a plant it points to the presence of the corresponding glucoside. This has been verified for the *Ericaceæ*, and the Gentians and the *Orchidaceæ*. Eighteen species of *Orchidaceæ* (all that have been examined) contain one or more glucosides hydrolysable by emulsin. The same applies to many of the *Scrophulariaceæ*, in particular to all species of the genus *Linaria*, and also to numerous *Leguminosæ*, *Proteaceæ*, etc. Owing to the peculiarly specific properties of enzymes, they are amongst the most delicate and certain reagents for investigating the constitution of certain organic compounds. Thus every glucoside hydrolysable by α-glucosidase is a derivative of α-dextrose, whereas β-glucosidase detects compounds derived from β-dextrose. In living organisms biochemical synthesis is a predominating factor in the accumulation of reserve food materials, for certain organic compounds insoluble in water form soluble compounds with dextrose; and this sugar, present in all organisms, appears as the principal liquefying agent, which can prevent the formation of certain concretions, and dispose of dangerous compounds so long as conditions remain suitable. On the other hand,

reversibility ensures the maintenance of the equilibria necessary for life. In organs where life is active, the liquid media are particularly favourable to hydrolysis and the utilisation of the food materials. In reserve organs, such as seeds, the medium, as it becomes less aqueous, is more favourable to synthetic processes.—J. H. L.

PRESENTATION TO MR. WATSON SMITH.

On February 23rd. Mr. Watson Smith was entertained at dinner by members of the Council and Publication Committee. Opportunity was taken to present to him, as a souvenir of his 33 years' service as Editor of this Journal, an album containing a short address, signed by the President and all available Past Presidents, Members of the Council and Publication Committee, and the abstractors. At the request of the President, the presentation was made by the *doyen* of the Chemical Press, Sir William Crookes, O.M., F.R.S.

Obituary.

RUSSELL FORBES CARPENTER.

Mr. R. Forbes Carpenter died at Hampstead on February 1st, at the age of 68. He was the son of Prof. W. B. Carpenter, F.R.S., and was educated at University College School and University College. On leaving college he was appointed assistant to Professor Graham, Master of the Mint, and later went to Bristol, where he joined the staff of the Netham Chemical Company. He was compelled to relinquish the latter appointment on account of his health, and to take a prolonged rest. Then, early in 1882, he was appointed a Sub-Inspector under the Alkali Act, in 1884 he was made Inspector, and in 1885, on the retirement of Mr. A. E. Fletcher, he became Chief-Inspector, a position which he held until ill-health compelled him to retire in April, 1910. Throughout his long tenure of office his exceptional organising powers were of the greatest value, especially in connection with the consolidation of the Alkali Acts of 1881 and 1892; in spite of the conflicting interests that had to be reconciled, he finally succeeded in overcoming the difficulties, with the result that the Alkali, etc., Works Regulation Act of 1906 was passed. The value of his work may be gathered from a perusal of his annual reports, full abstracts of which have appeared in this Journal. Mr. Carpenter was an original member of this Society and served as a Member of its Council from 1885 to 1888, and from 1896 to 1899, and as a Vice-President from 1888 until 1891, and also from 1899 to 1902. In 1894 he was elected Chairman of the Manchester Section, but resigned on his appointment as Chief Inspector in the following year. His earlier contributions to the Society's Journal include his address to the Manchester Section (this J., 1894, **13**, 1026), papers on "Conditions affecting the Oxidation of Nitrous Acid," and "The Solubility of Silver Chromate in Ammonium Nitrate" (see this J., 1886, **5**, 286, 287), and "Notes on Acetylene" (1895, **14**, 115). More recently, in collaboration with Mr. S. E. Linder, he carried out valuable researches on the estimation of acidity in the gases from the chamber process of sulphuric acid manufacture (this J., 1902, 1400; 1903, 577), and on the Claus kiln reaction (this J., 1903, 457; 1904, 577; 1905, 63).

Journal and Patent Literature.

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English.—6*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.
United States.—1*s.* each, to the Secretary of the Society.
French.—1 fr. 05 c. each, as follows: Patents dated 1902 to 1907 inclusive, Belin et Cie., 56, Rue des Francs Bourgeois, Paris (3e); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.

I.—GENERAL PLANT; MACHINERY.

PATENTS.

Agglomerating and sintering materials of all kinds; Process for —— by means of flameless surface combustion. G. Polysius, Eisengiesserei und Maschinenfabrik. Ger. Pat. 277,854, Feb. 18, 1913.

A SILO containing the material to be treated is mounted above a rotating plate or roller on the surface of which flameless combustion is produced in the known manner. The material is withdrawn automatically from the lower end of the silo by the rotating plate or roller. When a plate is used as the seat of the flameless combustion, it may be fixed and the silo rotated, or both plate and silo may be stationary and the material withdrawn by the action of a rotating scraper. Two plates loosely joined together may be used, one above the other, the upper one receiving the material from the silo and the lower one serving as the seat of the flameless combustion. The hot combustion gases are passed through the material in the silo or through tubes embedded therein.—A. S.

Catalytic reactions [hydrogenation]; Process for effecting ——. Soc. L'Oxylithe, and J. Walter. Fr. Pat. 471,108, Apr. 18, 1914. Under Int. Conv., Apr. 19, 1913.

To facilitate separation of the catalytic agent after the hydrogenation, catalysts are employed which are either magnetic in themselves, or may be rendered temporarily magnetic after the reaction, or rest upon magnetic supports, and therefore may be retained within the vessel by subjecting this to the action of a magnetic field when the hydrogenated product is withdrawn. Various devices for carrying out the process are described.—C. A. M.

Gases; Process for the purification of ——. Soc. L'Air Liquide. (Soc. anon. pour l'Etude et l'Exploit. des Proc. G. Claude). Fr. Pat. 471,162, July 2, 1913.

WATER partially saturated with lime is used under pressure to remove carbon dioxide and like impurities from gases which are to be liquefied; the greater part of the carbon dioxide dissolves in the liquid and the remainder is fixed chemically by the lime.—W. F. F.

Cooling hot liquids; Apparatus for —— and crystallising the substances dissolved therein. G. Graef. Ger. Pat. 277,181, March 22, 1912.

A DOUBLE-WALLED drum, having a helical groove on its outer surface, rotates in a trough. A cooling agent flows through the space between the walls of the drum in one direction and the liquid to be cooled flows around the outer surface of the drum in the opposite direction. The crystals which separate are removed by a scraper operating in the helical groove.—A. S.

Mixing gases and liquids; Apparatus for ——. G. Calvert, London. U.S. Pat. 1,123,092, Dec. 29, 1914. Date of appl., Feb. 18, 1914.

SEE Fr. Pat. 468,426 of 1914; this J., 1914, 973.

Deodorising oils and distilling and vaporising liquids. Eng. Pat. 367 of 1914. *See* XII.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal; Constituents of ——. [*Vacuum tar.*] A. Pictet and M. Bouvier. Chem.-Zeit., 1914, **38**, 1025.

FROM the "vacuum tar" obtained as previously described (this J., 1913, 1098; 1914, 70) the authors have further isolated new saturated hydrocarbons, C_9H_{18} and $C_{12}H_{24}$, besides hexahydro-*p*-cresol and other cyclic alcohols. By boiling Saar coal, from the Maybach mine, with benzene, an extract very similar to "vacuum tar" was obtained, consisting mainly of hydro-aromatic hydrocarbons with small quantities of alcohols and bases. This mixture was optically active, $[\alpha]_D = +0{\cdot}27°$.—J. H. L.

Coke. V. B. Lewes. J. Gas Lighting, 1915, **129**, 201—204.

THE author advocates carbonising coal at about 1050° C. and diluting the rich gas so made by passing "blue" water-gas into the foul main. In this way it is claimed that the maximum quantity of gas of about 560 B.Th.U. per cubic foot will be obtained, together with a fair quantity of tar of good quality, the highest yield of ammonia, and a coke containing from 5 to 6% of volatile matter. The coke will stand transport, will ignite and burn easily, and should be very suitable for domestic use.—W. H. C.

Industrial gas calorimetry. C. W. Waidner and E. F. Mueller. U.S. Bureau of Standards. Tech. Paper No. 36.

THE object of the work was to furnish information as to the accuracy attainable with the leading types of calorimeters used for gas-testing purposes, to indicate the sources of error to which they are liable, and to suggest precautions to be observed in their use. The calorimeters investigated were the Junkers (original type), Junkers (new type), Hinman-Junkers, Sargent, Simmance-Abady (English and American types), Boys, Doherty, and Parr. The following definitions, in connection with gas calorimetry, are considered as sufficiently precise for engineering and industrial use. *The total heating value* of a gas expressed in the English system of units, is the number of British thermal units produced by the combustion, at constant pressure, of the amount of gas which would occupy one cubic foot at 60° F. if saturated with water vapour, and under a pressure equivalent to that of 30 inches of mercury at 32° F. and under standard gravity, with air of the same temperature and pressure as the gas when the products of combustion are cooled to the initial temperature of gas and air, and when the water formed by combustion is condensed to the liquid state. *The net heating value* differs from the total heating value only as regards the final condition of the water produced by the combustion of the gas, which is regarded as remaining in a state of vapour. The net heating value is thus less than the total heating value by an amount of heat equal to the latent heat of vaporisation, at the initial temperature of the gas and air, of the water produced by the combustion of the gas. This figure may be taken as being equal to 580 calories per grm., corresponding to 2·3 B.Th.U. per c.c. *The observed heating value* is the value obtained by multiplying the mass of water which flows through the calorimeter during a test, by the corrected rise in temperature of the water, and dividing by the volume of gas burned (referred to standard conditions of temperature and pressure). It is stated that the general practice of regarding the observed heating value as being identical with the total heating value is inaccurate, as with a perfect flow calorimeter these two values would necessarily differ by 2% or more under certain atmospheric conditions, and with some of the calorimeters tested, the difference might amount to about 4%.

The principles of flow calorimetry and the method of making determinations of the total and net heating values are given, and a convenient record form is suggested for entering the necessary data obtained in performing a test. An investigation of the laboratory type of gas meters showed the importance of careful levelling of the meter and accurate adjustment of the water in the meter. From a series of experiments it was found that the volume of gas delivered per revolution at rates varying between 2 and 10 cubic feet per hour was constant to within about 0·1%; at higher rates, viz., 20 and 30 cubic feet per hour, the amount of gas delivered was increased by 0·5 and 1·0% respectively. The use of fractional revolutions is not recommended, as serious errors are possible by so doing. In any case, should such measurement be necessary, the fractional calibration of the meter dial should be made. The factors affecting heating value determinations with flow calorimeters are dealt with comprehensively, and the authors summarise their work in this connection as follows:—There is little probability of error due to incomplete combustion if the calorimeter is not operated at too high a rate of gas consumption. Care is necessary in measuring the rise of temperature of the water; standardised thermometers should be used and the thermometric corrections and stem corrections should be applied. If the calorimeter is operated with the inlet water at room temperature, if the burner is provided with radiation shields and is properly mounted within the calorimeter, if the calorimeter is operated at the normal rate and the correction for effect of atmospheric humidity is applied, the remaining heat losses will, for most calorimeters, introduce no significant error, while if such losses are significant for the calorimeter used, a correction may be applied. If the inlet water is not at room temperature the corrections necessary on this account may be readily applied. The flow of water and of gas can readily be made sufficiently constant. By waiting until the calorimeter is in

thermal equilibrium (from 5 to 30 minutes, depending on the calorimeter used) no significant error due to its lag will be introduced unless there are considerable variations in the heating value of the gas being tested, in the rate of flow of gas or water, etc. With a properly designed calorimeter, the drainage from which is uniform, the measurement of the condensed water offers no difficulty. Care is necessary in manipulating the change-over device, since large accidental errors may be introduced in this operation, although no significant constant error need be introduced. The weighing or measuring of the water with sufficient accuracy presents no difficulties. Great care must be exercised in calibrating the gas-meter and in making the necessary adjustments in its subsequent use. The other operations incidental to the measurement of gas volumes need introduce no significant error. If tests are made regularly for leakage of gas, the effects of leakage may easily be reduced to negligible proportions. With a standardized mercury barometer the accuracy required in gas testing is easily attainable. Errors may be introduced on account of changes in the character of the gas, due to various influences, the effect of which, however, may be easily avoided. It appears, therefore, that the accuracy attainable in heating value determinations with flow calorimeters is mainly limited by errors in adjusting the gas-meter, in measuring the temperature rise of the water, and in manipulating the change-over device, since the errors due to other factors may, by proper procedure, be made nearly, if not quite, negligible.

Comparative tests of heating value were made with flow calorimeters (Junkers and Hinman-Junkers) and Berthelot's bomb type of calorimeter, a correction being made to allow for differences between combustion at constant pressure and constant volume. The results with natural gas and hydrogen agreed within the limits of experimental error. With illuminating gas the results differed by about 1%, those obtained with the bomb type being lower than those obtained with the flow calorimeter. This difference has not yet been satisfactorily explained, but it is suggested that it may be due to the character of the gas.

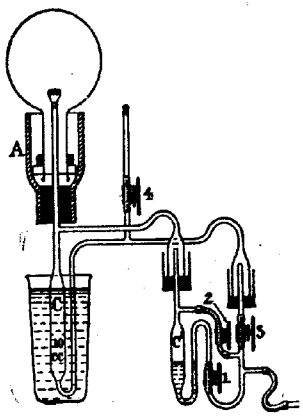
The last section of the work deals with the details of construction of the different calorimeters tested. In most cases by making slight alterations, such as raising the burner, affixing radiation shields to the latter, providing a mixing device, where necessary, in the outlet water tube, results were obtained in agreement, within the limits of experimental error, with those obtained by a Junkers (original type), which in turn had been found to yield results agreeing with those obtained from a calorimeter of the bomb type. In the hands of the authors, the Boys calorimeter was found not to be so efficient as the other forms of calorimeter tested. The Doherty and Parr calorimeters are described as not adapted to the determination of net heating value, although, like the remaining types tested, they gave satisfactory total heating values.—E. R. A.

Hydrogen sulphide in gas; Lead acetate test for ——. R. S. McBride and J. D. Edwards. Technol. Paper No. 41, U.S. Bureau of Standards, Aug. 19, 1914. 46 pages.

An investigation to determine the effects of variations in the paper, strength of lead acetate solution, time of exposure, humidity and rate of flow of gas, and form and size of apparatus used, upon the sensitiveness of the test. The sensitiveness is independent (of the strength of lead acetate solution 2—12%), and a 5% solution is recommended. The best and most concordant results are obtained with paper having a smooth (not shiny) surface, dipped, blotted, and used moist; by this means and with test periods of not more than 3 minutes' duration, the results are practically independent of the humidity of the gas; treatment of the moist paper with ammonia or carbon dioxide has no influence on sensitiveness. Increases in rate of gas flow produce less effect than proportional increases in the duration of test; a rate of between 4·5 and 5·5 cub. ft. per hour is recommended. Differences in intensity and direction of the gas currents within different forms of apparatus are largely responsible for variations in the results obtainable, as indicated by the greater sensitiveness of tests in which the gas impinges on, or passes through, the paper; hence the importance of conforming to specifications in regard to apparatus and procedure. The apparatus recommended (see fig.) consists of a glass chimney, 20 cm. long and 4·5 cm. wide, having a perforated stopper at each end; the tube of a gas burner from which the lava tip has been removed is inserted through the lower stopper, above which a watch-glass, 2·5—3 cm. in diameter, is supported on three glass pegs, 1—3 cm. high, to prevent the gas from impinging directly on the test-paper. The latter, 2 by 6 cm., is hung on a glass hook attached to the upper stopper, which is also provided with a flat flame burner passing 5 cub. ft. per hour under ordinary gas pressure. Apparatus of the "penetration" type is not recommended for general inspection work.—W. E. F. P.

Sulphur in motor spirits; Determination of ——. W. A. Bradbury and F. Owen. Chem. News, 1915, 111, 39—41.

With the modification here shown of the apparatus previously described (this J., 1914, 1001), the sulphur in motor spirits may be determined volu-



metrically within about 2 hours. The combustion chamber is an inverted round-bottomed flask (see fig.), upon the shortened neck of which is fitted a disc of tinned copper (2½ in. diam.) with small holes round the circumference. Rings are soldered on each side of the disc, the lower one resting upon the constricted portion of the absorption vessel, A, whilst the space between the neck and the ring is fitted with a cork. The air for the combustion is supplied by a water blower connected with the burettors, C, C', and mercury joints replace the rubber connections of the former apparatus. Ten

c.c. of the spirit to be tested is placed in C, and pure benzene in C', whilst the absorption vessel is charged with 50 c.c. of about $N/10$ sodium carbonate solution and 20 c.c. of neutral (10 vol.) hydrogen peroxide. When the pure benzene is burning with a small blue flame, the flask is lowered over it until the disc is covered by the absorbing liquid. The taps are then turned as described (*loc. cit.*) and the motor spirit burned with a small blue flame, while the platinum coil above the gauze cap of the burner is maintained at its maximum state of incandescence. When the products of combustion are bubbling steadily through the liquid, the water in the beaker is very gradually heated from 27° C. to about 43° to 49° C., and when only about 1 c.c. of the spirit is left, 1 c.c. of absolute alcohol is introduced through the tube, 4. After two washings with alcohol in this way the air supply is reduced to a gentle current, which is continued until the chamber is cold. The absorbing liquid and washings are boiled, and the excess of sodium carbonate titrated with standard sulphuric acid, using lacmoid as indicator. Tests with this apparatus proved that in burning spirit in a lamp with a wick, the amounts of sulphur consumed varied greatly at different periods of the combustion, but that no selective action occurred during the spontaneous evaporation of benzene (containing sulphur) through the wick of an unlighted lamp. In the distillation of a sample of benzene, 49% of the sulphur was contained in the first fraction of 20%.—C. A. M.

Bituminous shales of Sicily and their industrial importance. G. Ponte. L'Ind. Chim., Min., e Met., 1915, **2**, 31—34.

DEPOSITS of bituminous shale occur in various parts of the province of Messina and are easily accessible without costly excavation. In a laboratory trial with about 150 kilos., distilled in an iron retort with the aid of superheated steam at 2 atmospheres pressure, there were obtained 7—9% of crude oil of sp. gr. 0·928 at 15° C., 5—6% of ammoniacal liquor (0·9—1% NH_3), and 3—4% of gas containing only traces of carbon dioxide. The crude oil contained 3·4% S, and yielded 29—31% of light oil of sp. gr. 0·820, and up to 12% of crude paraffin. If the shale were distilled in Pumpherston retorts, the gas produced would suffice for heating the retorts without any extra fuel. During the purification of the light oil with sulphuric acid, some ichthyolsulphonic acid, soluble in water, was produced. A concession for the working of the deposits has been granted.—A. S.

Lubricating oils and greases. Board of Trade Bulletin No. 45.

THE value of the exports of lubricating oils and greases to all destinations from Germany in 1912 was:—Mineral train-oil (lubricating oil, paraffin oil, vaseline oil, vulcan oil, etc.), £329,650; other lubricants manufactured with fats or oils (including axle-grease), £157,700; total, £487,350: from Austria-Hungary (1913):—Mineral oil, refined or half-refined, heavy, the density of which exceeds 880°, also lubricating oils, mixed or not with animal or vegetable oils or greases, £855,800; axle-grease mixed or not with mineral oil or mineral grease, £1580; total, £860,380. The Austrian figures appear to cover a somewhat larger field than the German; lubricating oils, etc., are not separately recorded in the export returns of the United Kingdom.

Germany's largest market for lubricating oil, etc., in 1912, was British India. The United Kingdom, Scandinavia, the Netherlands, Italy, and South America also took large consignments of this commodity from Germany.

Austrian exports of lubricating oils, etc., go chiefly to European countries, the principal purchasers being Sweden, Denmark, Belgium, France, Switzerland, United Kingdom, and Italy.

The exports of lubricating oils and greases which might be replaced by similar British products are as follow:—(A) In the United Kingdom:—German trade (1912): mineral train oil (lubricating oil, etc.), £43,550; other lubricants, £15,250; Austrian trade (1913): mineral oil and lubricating oils, etc., £46,700. (B) In Colonial and neutral markets:—German trade (1912): mineral train oil (lubricating oil, etc.), £256,500; other lubricants, £95,350; Austrian trade (1913): mineral oil and lubricating oils, etc., £338,950; axle-grease, £4380.

Petroleum imports of the United Kingdom. Petroleum Review, Jan., 1915.

THE imports of petroleum products into the United Kingdom during 1914 are classified as follows, quantities being given in gallons:—

Country.	Illuminating.	Lubricating.	Residuals.	Gas oil (Solar).	Benzine.	Fuel oil.	Other descriptions.	Totals.
Belgium	—	538,100	2,000	—	32,230	—	1,350	573,680
Canada	—	21,300	88,510	—	—	—	—	109,810
Dutch Indies	90	—	—	—	52,125,000	83,800	1,750,240	53,958,130
Germany	29,250	1,471,510	—	—	—	—	7,430	1,508,190
Holland	—	12,230	—	182,000	5,063,430	280	13,690	5,271,630
Mexico	12,364,790	256,800	—	—	2,434,380	15,031,040	995,010	31,082,020
Roumania	13,033,080	—	961,440	—	6,412,480	2,348,570	—	22,755,570
Russia	4,574,390	6,454,480	5,400	—	10,202,600	—	630	21,237,500
U.S.A.	116,595,460	54,846,900	2,570,740	83,470,250	40,766,060	18,748,300	735,410	317,705,710
Other countries	4,170	260,810	—	1,460	3,423,970	8,900	1,843,230	5,542,540
Totals	146,601,230	63,862,130	3,628,090	83,653,710	120,460,150	36,200,890	5,346,990	459,744,780

Mineral oil exports from the United States. U.S. Dept. of Commerce, Jan., 1915.

THE figures given below represent about 98% of the shipments from all ports in the United States during 1913 and 1914:—

	1913.		1914.	
	Gallons.	$	Gallons.	$
Crude oil	184,991,667	8,174,767	123,590,451	4,927,525
Illuminating oil	1,118,096,475	71,035,201	1,008,403,576	63,942,789
Lubricating and paraffin oils	205,825,151	29,289,805	190,888,017	25,916,336
Naphthas, gasoline, etc.	178,971,302	26,932,474	199,754,004	24,437,062
Residuum, gas oil, fuel oil, etc.	420,480,849	10,[illegible]917	701,612,276	19,158,282
Total	2,108,365,444	147,174,164	2,224,248,324	138,381,994

Naphthalene; Recovery of —— from pastes for the manufacture of artificial coal [briquettes]. M. Mayer. Annali Chim. Appl., 1914, 2, 357—360.

ARTIFICIAL coal is made by mixing sawdust from soft wood with silica, coal tar, and water, moulding the resulting mass into cylinders, and carbonising the latter after drying. The cylinders are dried under cover for about 40 days, and a yellowish deposit is produced on the roof of the drying chamber: this deposit proved to be nearly pure naphthalene. The author recommends that the drying be effected in closed chambers by hot air or waste gases and that a cooling chamber be provided for recovery of the volatilised naphthalene. In laboratory experiments with pastes containing the normal quantity (20—25%) of tar, satisfactory drying was effected in 50 hours at 40°—60° C. by a current of air, and 0·7—0·95% of naphthalene (referred to the weight of the paste) was recovered. —A. S.

PATENTS.

Coal washing; Process of and apparatus for ——. C. Burnett, Durham. Eng. Pat. 4687, Feb. 23, 1914.

COAL is delivered from a hopper on to an inclined movable belt or trough, and washing water is supplied from two jets behind the hopper; two additional sprays are provided behind the washing jets to recover fine coal from the dirt, the part of the belt under these sprays being inclined at a greater angle than the remainder.—W. F. F.

Gas retorts. H. J. Toogood, and R. Dempster and Sons, Ltd., Elland, Yorks. Eng. Pat. 9923, April 22, 1914.

AN installation of retorts is heated by gas supplied from a single producer, through a number of flues, each provided with an auxiliary air supply so that it may be converted into a temporary combustion chamber when cold retorts are to be brought into use. The hot combustion gases are led to the retort-heating compartments through a passage controlled by a damper, and when the compartments are heated to such a degree that explosions are no longer to be feared, the auxiliary air inlet is closed and the usual secondary air inlets opened. —W. F. F.

Vertical gas retorts. A. G. Glasgow. Fr. Pat. 471,142. April 20, 1914.

TO avoid leakage of gas at the base of the retort, the horizontal door carries a fuel-supporting platform nearly fitting the retort. Gas is withdrawn from the space between the door and the platform so that the gas pressure therein is insufficient to cause leakage. Alternatively the door and platform may be independent.—W. F. F.

Coal-gas-generating apparatus. H. A. Carpenter, Sewickley, Pa., and D. D. Barnum, Worcester, Mass., Assignors to Ritter-Conley Manufacturing Co., Pittsburgh, Pa. U.S. Pat. 1,122,683, Dec. 29, 1914. Date of appl., Sept. 17, 1914.

THE horizontal gas retorts are each provided with a mouthpiece and adjacent to this, with a conduit leading to a common vertical uptake. The conduit is provided with a valve and the mouthpiece may be closed by a door, so that the whole length of the conduit may be accessible from the mouthpiece for cleaning.—W. F. F.

Gas furnace with inclined retorts. M. de Brouwer and C. Meitzler. Fr. Pat. 470,359, March 25, 1914.

THE retorts are slightly tapering inclined tubes, the coke being discharged by gravity at the larger lower end, and the gas at the upper end. Heating is effected by burners fed with gas from a producer situated below the retorts and surrounded by recuperators through which secondary air for the burners passes in zigzag passages in the opposite direction to the hot combustion gases.—W. F. F.

Distillation ovens; Process and apparatus for introducing compressed coal into ——. E. Heiderich. Fr. Pat. 470,216, March 28, 1914. Under Int. Conv., Sept. 15, 1913.

THE coal is compressed into a block by two vertical plates mounted above the oven, which alternately approach and recede from one another. The compressed block is dropped through a vertical conduit into the oven.—W. F. F.

Gas producers. H. J. Green, Birkenhead. Eng. Pat. 17,687, July 27, 1914.

THE fuel is fed in small regulated charges by a reciprocating ram into the high temperature zone of the producer, and is rotated by a rotary grate. Secondary air inlets arranged about the high temperature zone may be used with inferior fuel, and the upper part of the producer may be rotated in the same direction as the grate, suitable water seals being provided between the fixed and movable parts.—W. F. F.

Gas-washing. H. A. Brassert and C. J. Bacon, Chicago, Ill. U.S. Pat. 1,123,232, Jan. 5, 1915. Date of appl., Oct. 15, 1913.

A GAS-WASHING tower contains a number of superposed, horizontal dishes each provided with a perforated annular plate through which water passes, and gas apertures are arranged alternately within and without the perforated annulus in adjacent dishes, so that the gas in passing upwards from one dish to the next traverses the water stream. A spiral is placed in the gas outlet of the uppermost dish in order to impart a rotary motion to the gas and thus remove suspended particles of water. —W. F. F.

Gaseous fuel; Production of —— from liquid fuel. A. W. Southey, London. Eng. Pat. 5331, March 2, 1914.

LIQUID hydrocarbons of high flash point are sprayed into the base of a vertical chamber, into which sufficient air is introduced for partial combustion. Air to be carburetted is drawn through the heated spray at a point above that at which the flame is extinguished by lack of air. (See also Eng. Pat. 4006 of 1913; this J., 1914, 411.) —W. F. F.

Methane; Production of —— from a gaseous mixture such as water-gas, by the action of steam in the presence of lime [or other catalysts]. L. Vignon. First Addition, dated July 8, 1913, to Fr. Pat. 469,907, June 2, 1913.

WATER-GAS mixed with steam is passed over catalysts such as iron filings, copper turnings, silica, magnesia, or alumina at 550°—1200° C., in place of lime, whereby methane (3·3—4·3%) is produced, the proportion of carbon monoxide reduced, and that of hydrogen increased.—W. F. F.

Gas; Process and apparatus for purifying and cooling ——. Poetter, G. m. b. H. Fr. Pat. 471,007, April 16, 1914.

THE gas to be washed travels first against and then with cooling and washing water sprayed from a central distributor, being directed in its path by partitions attached respectively to the horizontal casing and to the central shaft and a sleeve thereon. The partitions attached to the shaft and the sleeve are connected by longitudinal rods, forming two or more cylindrical cages, of which adjacent ones revolve in opposite directions.—W. F. F.

Sulphur and cyanogen; Extraction of —— from the gases resulting from coal distillation. E. Ciselet and C. Deguide. Fr. Pat. 471,234, April 22, 1914. Under Int. Conv., May 2 and Aug. 6, 1913, and March 13, 1914.

THE hydrogen sulphide and cyanogen compounds are removed from the gas by means of ferric hydroxide suspended in a liquid, the ferric hydroxide being subsequently regenerated by a current of air. When regeneration in this way is no longer effective, the purifying material is treated with sulphuric or hydrochloric acid, which dissolves all but free sulphur and ferrocyanides. Sulphur is recovered from the residue by dissolving the ferro- and ferri-cyanides in an alkali, while ferric hydroxide is recovered from the liquor by precipitation with ammonia and used over again. Ammonia may be recovered from the alkaline ferro- and ferri-cyanide solution by treatment with lime.—W. F. F.

Hydrocarbon oils; Process for the treatment of heavy ——. [Making gasoline.] T. Myers, Bournemouth. Eng. Pat. 19,391, Aug. 27, 1913.

HEAVY hydrocarbon oil is agitated with lime-water and a relatively small amount of an aluminium salt, such as alum, the mixture is allowed to settle, the aqueous layer drawn off, and the residual oil filtered.—F. SODN.

Hydrocarbon liquid suitable for use in internal combustion engines; Method of making a ——. D. R. McArthur, Assignor to E. W. Tait, Bradford, Pa. U.S. Pat. 1,119,974, Dec. 8, 1914. Date of appl., June 28, 1913.

COMPRESSED natural gas and a higher paraffin which has been atomised or vaporised and compressed at a greater pressure than the natural gas, are maintained at a suitable temperature by utilising the heat of compression, and then mixed together, the mixture being cooled to obtain a liquid of lower specific gravity than that of the higher paraffin employed.—F. SODN.

Hydrocarbons; Production of light —— from heavy hydrocarbons. F. Bergius. Fr. Pat. 470,551, April 6, 1914. Under Int. Conv., May 5, 1913.

HEAVY hydrocarbons (*e.g.*, petroleum oils, tar oils, residues, etc.) are subjected to the action of hydrogen, nitrogen, carbon monoxide, or methane under pressure (*e.g.*, 100 atmospheres), while heated to below 420° C.—W. E. F. P.

Shale oils; Process of desulphurising sulphur-bearing ——. W. A. Hall, New York. Eng. Pat. 26,756, Nov. 21, 1913.

OIL from Kimmeridge and like shale is charged with sulphur dioxide and distilled, and suspended sulphur is separated from the distillate, for example by filtration. The sulphur still present in the distillate can now be largely or wholly removed by known methods, for example by the Frasch process.—F. SODN.

[Hydrocarbon] oil; Treating [removing water from] ——. J. A. Dubbs, Los Angeles, Cal., Assignor to National Hydrocarbon Co. U.S. Pat. 1,123,502, Jan 5, 1915. Date of appl., Nov. 20, 1909.

EMULSIFIED hydrocarbon oil, containing at least 5% of water, is passed continuously, under pressure, first through a relatively constricted conduit, and then through a larger one, in each of which the temperature is raised approximately to the boiling point of water under such pressure. The pressure is produced solely by the vapours generated from the oil under treatment. The stream of oil is then cooled, relieved of pressure, and submitted to a gravity-separating operation. The steam and oil vapours, evolved during the heating, are condensed, and the floating layer of oil is removed and added to the main bulk.—B. N.

Petroleum; Decolorisation and deodorisation of ——. Soc. Le Terebinto. Fr. Pat. 471,253, July 5, 1913.

PETROLEUM is treated successively with sulphuric acid, a mixture of the latter and sulphuric anhydride in equal parts, powdered aluminium chloride, calcium chloride, and a dilute solution of sodium hydroxide.—W. E. F. P.

Briquettes; Manufacture of —— from suitable briquette materials. C. Fohr, Munich, Germany. U.S. Pat. 1,123,719, Jan. 5, 1915. Date of appl., July 24, 1913.

SEE Ger. Pat. 263,158 of 1912; this J., 1913, 901.

Temperature of combustion; Process of regulating the ——. A. G. Glasgow, Richmond, Va., U.S.A. From J. M. Rusby and J. H. Taussig, Philadelphia, U.S.A. Eng. Pat. 12,256, May 18, 1914.

SEE U.S. Pat. 1,110,991 of 1914; this J., 1914, 1001.

Gas producers. H. F. Smith, Lexington, Ohio, U.S.A. Eng. Pat. 11,247, May 6, 1914.

SEE U.S. Pat. 1,098,059 of 1914; this J., 1914, 782.

Gas; Process for purifying ——. A. G. Glasgow, Richmond, Va., U.S.A. From C. J. O'Donnell and A. F. Kunberger, Philadelphia, U.S.A. Eng. Pat. 12,463, May 20, 1914.

SEE U.S. Pat. 1,105,578 of 1914; this J., 1914, 911.

Ammoniacal liquors from gas-works; Treatment of ——. Berlin-Anhaltische Maschinenbau A. G. First Addition, dated March 2, 1914, to Fr. Pat. 470,117, Feb. 28, 1914. Under Int. Conv., Oct. 24, 1913.

SEE Ger. Pat. 272,985 of 1913; this J., 1914, 685.

Ammonia; Separation of —— from gases [coal gas, etc.]. J. Marr. Fr. Pat. 470,696, April 8, 1914.

SEE Eng. Pat. 6291 of 1913; this J., 1914, 472.

Manufacture of hydrogen [from water-gas, producer-gas, etc.]. Eng. Pat. 6476. *See* VII.

Purification of petroleum and its distillates [and lignite tar oils]. Ger. Pat. 277,288. *See* III.

Process of obtaining fertiliser [from the products of combustion from gas engines]. U.S. Pat. 1,122,923. *See* XVI.

Drying and gasification of sludge from the clarification of waste liquids. Fr. Pat. 470,848. *See* XIXB.

IIB.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Liquids of constant boiling-point, for use in constant temperature heating baths. A. Golodetz. Chem.-Zeit., 1914, 38, 1253.

IN the following list two classes of liquids with constant boiling-points are included:—(1) mixtures in definite proportions of two, or three, miscible

liquids; (2) heterogeneous mixtures (in any proportion provided two liquid phases are present) of two immiscible liquids. The boiling points given are the temperatures of the vapours when the liquids are in ebullition.

B. pt. °C.	Composition of liquid.
33	Water and ether (heterogeneous)
36·5—37·5	Alcohol (3) and ethyl bromide (97)
38	Carbon bisulphide (87) and methyl alcohol (13)
39—40	Carbon bisulphide (71) and methyl acetate (29)
42·5	Carbon bisulphide (91) and alcohol (9)
53·5—54·5	Methyl alcohol (12) and chloroform (88)
55·5	Methyl alcohol (20·6) and carbon tetrachloride (79·4)
58	Methyl alcohol (38·4) and benzene (61·6)
59—59·5	Alcohol (6) and chloroform (94)
62	Methyl alcohol (47) and ethyl acetate (53)
64·8	Benzene (74·1), alcohol (18·5) and water (7·4)
68	Alcohol (32·4) and benzene (67·6)
71·5	Alcohol (31) and ethyl acetate (69)
74·8	Carbon tetrachloride (77·15) and alcohol (22·85)
79·5	Benzene (90·5) and isobutyl alcohol (9·5)
84·5	Water and toluene (heterogeneous)
87·7	Water (28·3) and propyl alcohol (71·7)
91—91·5	Propyl alcohol (53) and toluene (47)
92·5	Water (41) and pyridine (59)
94—94·5	Water and turpentine (heterogeneous)
95	Water (7) and chloral (93)
98·5	Water and ethylaniline (heterogeneous)
99	Water and diethylaniline (heterogeneous)
104	Toluene (70) and acetic acid (30)
113—113·5	Acetic acid (27) and xylene (73)
121—122	Amyl alcohol (30) and ethylene dibromide (70)
125—126	Amyl alcohol (52) and *m*-xylene (48)

—E. W. L.

Carbons for electric lighting. Board of Trade Bulletin No. 82.

THE value of carbons for electric lighting exported from Germany, Austria-Hungary, and the United Kingdom, to all destinations was as follows:—From Germany (1912): carbon sticks for electrical arc lamps, £451,400; electrode carbons, carbon threads for electrical illuminating appliances, carborundum articles other than grinding, polishing and whet stones, and other articles of plastic carbon or gas carbon (retort graphite), £90,200; total, £541,600. From Austria-Hungary (1913): carbons for lighting purposes, less than 1 kilo. per metre, etc., £48,175; from the United Kingdom (1913): electrical carbons, £10,064. The figures for Germany include the value of carbons exported to the United Kingdom (£90,650), and to Austria-Hungary (£45,400), and those for Austria-Hungary include exports to Germany (£21,500), and to the United Kingdom (£9,200). British exports of carbons to Germany and Austria-Hungary are negligible. The principal destinations of German carbons were the United States, France, Belgium, Italy, Norway, Argentine, Russia, and Holland, and of Austrian carbons, Italy, Roumania, Belgium, and France.

In view of the large quantities of coal annually carbonised in the United Kingdom at gasworks and coke ovens, there would seem to be a distinct possibility of diverting a large portion of this trade to the United Kingdom. The maximum amount of the export trade in carbons for electric lighting which, under present circumstances, might be diverted to British manufacturers is about £100,000 in the United Kingdom market and about £423,000 in Colonial and neutral markets.

PATENTS.

Glower for electrical incandescent lamps. O. M. Thowless, Newark, N.J. U.S. Pat. 1,123,625, Jan. 5, 1915. Date of appl., Jan. 20, 1911.

FILAMENTS composed of metallic particles and a volatile binding material, are subjected to a gradually increasing temperature until the binding material is eliminated and the metallic particles are fritted together. They are then heated electrically above the softening point of platinum in a vessel exhausted of air, and a mixture of tungsten hexachloride vapour and hydrogen is admitted. A coating of tungsten, by means of which the resistance is equalised, is deposited on the filaments.—B. N.

III.—TAR AND TAR PRODUCTS.

Tars, [lar] oils, and pitches; Determination of the specific gravity of ——. J. M. Weiss. J. Ind. Eng. Chem., 1915, **7**, 21—24.

FOR oils a standardised hydrometer is recommended: for creosote oil and, if great accuracy is not required, also for light oils, the value at 15·5° C. is calculated from that obtained at a higher temperature by the formula: sp. gr. at 15·5°/15·5° C. = sp. gr. at X°/15·5° C. + 0·0008 (X°—15·5°). For values obtained with a pyknometer, sp. gr. bottle, or Westphal balance, the temperature correction formula is: sp. gr. at 15·5°/15·5° C. = sp. gr. at X°/X° × sp. gr. water at X°/15·5° C. + 0·0008 (X°—15·5°). For smaller quantities of oil than 100 c.c. a Westphal balance is recommended, with a special plummet for quantities less than 20 c.c. In the case of tars and pitches, a platinum pan with supporting wires joined together at their upper ends and formed into a hook is used, and is suspended from the balance by a waxed silk thread. It is weighed in air and in water at 15·5° C., first empty and then filled with the sample. The sp. gr. $= \frac{c-a}{(b+c)-(a+d)}$, where a and b are the weights of the pan in air and in water respectively and c and d are the corresponding weights of the pan plus sample. Selected pieces of pitch may be used or the sample may be melted and cooled slowly under slight pressure to prevent the formation of voids in the interior.—A. S.

Toluene in commercial toluol; Determination of the percentage of ——. H. G. Colman. J. Gas Lighting, 1915, **129**, 196—198.

FROM a large number of distillations of mixtures of known amounts of pure benzene, toluene, and xylene, the following process has been worked out. A standard Engler 100 c.c. distillation flask is used, having the following dimensions:—diam. of bulb 6·5 cm., length of neck 15·0 cm., diam. of neck 1·6 cm., length of side tube 10·0 cm. and angle of side tube 75°. The flask and condenser are first rinsed out with a little of the sample and allowed to drain, and then 100 c.c. of the sample is poured from a graduated 100 c.c. cylinder into the flask. An accurate thermometer registering from 50° to 150° C. and divided into $\frac{1}{5}$ degrees is fixed in the neck of the flask with the top of the mercury bulb just below the level of the side tube. The flask is heated by a naked flame provided with a wire gauze screen to protect the bulb of the retort and the flame from draughts. The side tube is connected with an 18-in. Liebig condenser and the distillation is carried out at the rate of two drops per second from the end of the condenser. The distillate is received in a graduated 100 c.c. cylinder and the number of c.c. distilling respectively below 105° C., between 105° and 117° C., and above 117° C., are noted. As each point is reached the flame is removed and the condenser is allowed to drain before reading the volume. The total distillate should measure at least 99·5 c.c. The percentage of toluene is found from the accompanying table.

Table for ascertaining the percentage of pure toluene in commercial toluol from the percentages of the fractions boiling below 105° C. and above 117° C.

Percentage boiling *below* 105° C. ⟶

Percentage boiling above 117° C.	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Percentage boiling above 117° C.
50																																															50
49	50																																														49
48	51		50																																											48
47	52	51		50																																										47
46	53	52	51		50																																									46
45	53	53	52	51	51	50																																									45
44	54	53	53	52	52	51	50																																								44
43	55	54	54	53	53	52	51	50																																							43
42	56	55	54	54	53	53	52	52	51	50																																						42
41	57	56	55	55	54	54	53	53	52	51	50																																					41
40	58	57	56	56	55	55	54	54	53	52	51	51	50																																				40
39	59	58	57	57	56	55	55	54	54	53	52	52	51	51	50																																		39
38	60	59	58	58	57	56	56	55	54	54	53	53	52	52	51	50																																	38
37	60	60	59	58	58	57	57	56	55	55	54	53	53	52	52	51	50																																37
36	61	61	60	59	59	58	57	57	56	56	55	54	54	53	53	52	51	50	50																														36
35	62	62	61	60	60	59	58	58	57	57	56	55	55	54	54	53	52	51	51	50																													35
34	63	63	62	61	61	60	59	59	58	57	57	56	56	55	55	54	53	52	52	51	50	50																											34
33	64	63	63	62	62	61	60	60	59	58	58	57	57	56	55	55	54	53	53	52	52	51	50																										33
32	64	64	64	63	63	62	61	61	60	60	59	58	58	57	57	56	55	54	54	53	53	52	51	50	50																								32
31	65	65	64	64	63	63	62	62	61	61	60	59	59	58	58	57	56	55	55	54	54	53	52	51	50	50																							31
30	66	66	65	65	64	64	63	63	62	62	61	60	60	59	59	58	57	56	56	55	55	54	54	53	52	52	51	50	50																			30
29	67	66	66	65	65	64	64	64	63	63	62	61	61	60	60	59	58	57	57	56	56	55	55	54	53	53	52	52	51	50	50																	29
28	68	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	59	58	58	57	57	56	56	55	54	54	53	53	52	52	51	50	50														28
27	68	68	67	67	67	66	65	65	64	64	64	63	63	62	62	61	60	59	59	58	58	57	57	56	55	55	54	54	53	53	52	52	51	50													27
26	69	68	68	67	67	67	67	66	65	65	64	64	63	63	63	62	61	60	60	59	59	58	58	57	57	56	55	55	54	54	53	53	52	51	50	50											26
25	70	69	69	68	68	67	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	59	59	58	58	57	57	56	55	55	54	54	53	52	52	52	51	50	50								25
24	71	70	70	69	69	68	68	68	67	67	66	66	65	65	64	64	63	63	62	61	61	60	60	60	59	58	58	57	56	56	55	55	54	53	53	53	52	51	51	50	50						24
23	72	71	71	70	70	69	68	68	68	67	67	66	66	65	65	64	64	64	63	62	62	61	61	60	60	59	58	57	57	56	55	55	54	54	53	52	52	51	50								23
22	72	72	72	71	71	70	69	69	68	68	67	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	60	59	59	58	58	57	56	56	55	55	54	53	53	53	52	51	51	50			22
21	73	73	72	72	72	71	70	70	69	68	68	68	67	67	67	66	65	65	65	64	64	63	63	62	62	61	61	60	60	59	59	58	57	57	56	56	55	55	54	54	53	53	52	51	50		21
20	74	73	73	73	72	72	71	70	70	69	69	68	68	68	67	67	66	66	65	65	64	64	64	63	63	62	62	61	61	60	60	59	59	58	58	57	57	56	55	55	54	54	53	52	51	50	20
19	75	74	74	73	73	72	72	71	71	70	70	69	69	68	68	68	67	67	66	66	65	65	65	64	64	63	63	62	62	61	61	60	60	59	58	58	57	57	56	55	55	54	54	53	52	51	19
18	75	75	74	74	74	73	72	72	72	71	71	70	70	70	69	69	68	68	68	67	67	66	66	65	65	64	64	64	63	63	62	62	62	61	61	60	60	59	58	58	57	57	56	56	55	54	18
17		75	75	75	74	74	73	73	72	72	72	71	71	70	70	69	69	68	68	67	67	67	66	66	65	65	64	64	63	63	63	62	62	62	61	61	60	60	59	58	58	57	57	56	56	55	54	17
16			75	75	75	74	74	73	73	73	72	72	72	71	71	70	70	69	69	68	68	68	67	67	66	66	65	65	64	64	64	63	63	63	62	62	62	61	61	60	60	59	58	58	57	57	57	56	16
15					75	75	75	74	74	73	73	73	72	72	72	72	71	71	70	70	69	69	68	68	68	67	67	67	66	66	65	65	64	64	63	63	63	62	62	61	61	61	60	60	59	58	58	58	57	56	15
14							75	75	75	74	74	73	73	72	72	72	72	71	71	70	70	69	69	68	68	68	67	67	67	66	66	65	65	65	64	64	63	63	62	62	62	61	61	60	60	59	59	58	58	57	56	55	14
13									75	75	75	74	74	73	73	73	72	72	72	71	71	70	70	69	69	69	68	68	67	67	67	66	66	65	65	65	64	64	63	63	63	62	62	61	61	60	60	59	58	58	57	56	55	54	13
12											75	75	74	74	74	73	73	73	72	72	72	71	71	70	70	70	69	69	68	68	68	67	67	66	66	66	65	65	65	64	64	63	63	62	62	62	61	61	60	60	59	58	57	56	55	54	12
11												75	75	75	74	74	74	73	73	73	72	72	71	71	71	71	70	70	69	69	69	68	68	67	67	67	66	66	66	65	65	64	64	63	63	63	62	62	61	61	60	59	58	57	56	55	54	11
10															76	75	74	74	74	73	73	73	72	72	72	71	71	71	70	70	70	69	69	68	68	68	67	67	67	66	66	65	66	65	64	64	64	63	62	61	60	59	58	57	56	55	10
9																	75	75	75	74	74	74	73	73	73	72	72	72	71	71	71	70	70	70	69	69	68	68	67	67	66	66	66	65	65	64	63	62	61	60	59	58	9
8																				75	75	74	74	74	73	73	73	72	72	72	71	71	70	70	70	69	69	68	68	67	67	66	66	65	64	63	62	61	60	59	8
7																						75	75	74	74	74	74	73	73	73	72	72	72	71	71	71	70	70	70	69	69	68	68	67	67	66	65	64	63	62	61	7
6																											75	75	75	75	74	74	74	74	73	73	73	73	72	72	72	71	71	71	70	70	69	68	67	66	6
5																																															5
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	

Percentage boiling *below* 105° C. ⟶

The figure corresponding with the number of c.c. distilling below 105° C. is found in the bottom horizontal line and that corresponding with the number of c.c. distilling above 117° C. in the outer vertical column. The number which is found at the intersection of vertical and horizontal lines from these points represents the percentage of toluene in the sample. The table only holds good for samples containing between 50 and 75% of toluene. Other samples must be mixed with benzene, toluene, or xylene before distillation. In the case of samples yielding less than 5% below 105° C., 90 c.c. is mixed with 10 c.c. of pure benzene; with those yielding less than 5% above 117° C., 90 c.c. is mixed with 10 c.c. of xylene boiling at 136° to 143° C.; with those yielding less than 5% both below 105° and above 117° C., 80 c.c. is mixed with 10 c.c. of benzene and 10 c.c. of xylene; with those yielding more than 50% above 117° C., 80 c.c. is mixed with 20 c.c. of pure benzene, and with samples yielding more than 50% below 105° C., 80 c.c. is mixed with 20 c.c. of pure toluene. If the sample contains traces of paraffins, 100 c.c. is fractionated from a round flask provided with a Young twelve-bulb "pear" column and the sp. gr. of the portion distilling between 107° and 115° C. is determined. For every 0·001 that the sp. gr. found is below 0·868, a reduction of 0·75% is made in the percentage of toluene found.—W. H. C.

Toluene; Supply of ——. J. Gas Lighting, Feb. 9 and 16, 1915.

SPEAKING at a meeting of representatives of the gas industry, held in Manchester on Feb. 5th, Mr. Macintosh Williams said that he was present on behalf of the War Office Committee on the Supply of High Explosives. The Government was requesting the larger gas undertakings to wash the toluol contents out of their gas, and, in case of need, replace the toluol contents with benzol to preserve the illuminating and the calorific power. The War Office proposed, at first, to seek the assistance of those who were carbonizing 80,000 or 90,000 tons of coal per annum. The Government suggested that they should supply the plant, and pay for the cost of erection and all expenses in connection with it; that a small percentage on the working expenses connected with extracting the toluol should form the profit, and that their profit should increase in proportion to the percentage of toluol supplied, having regard to the total percentage of toluol which might exist in the particular gas. The Government proposed a minimum of 5% on the working expenses for up to 70% of the total toluol contents, and a further 2½% on the working expenses for each 5% additional. The Birmingham Corporation had made some experiments already with regard to the matter, the results of which were open for any who were willing to take the matter up for the Government. They thought that if the wash-oil employed for washing or scrubbing the gas was first of all pre-benzolized, then the wash-oil would only take up the toluol contents of the gas and leave the benzol contents of the gas to a certain extent intact. If the oil were pre-benzolized to the extent of 5%, it was possible to extract nearly 80% of the toluol, and leave over two-thirds of the benzol still in the gas.

Dr. W. B. Davidson, of Birmingham, has sketched a plant suitable for use in a works carbonising about 800 tons of coal per day. The debenzolised oil from the crude still is mixed with a small quantity of benzol (say 4 to 5% by vol.), and pumped at the rate of about 1300 galls. per hour through scrubbers (two sets of three in series.) The oil now runs to the store-tank whence it is pumped continuously at the rate of about 1300 gallons an hour through a heater, where heat interchange takes place between the cold oil and the hot oil leaving the crude still; then through an exhaust steam-heater and a superheater (containing a closed high-pressure steam-coil) to the crude still, where it falls from tray to tray to the lowest compartment, meeting a current of high temperature steam, which deprives it of its crude benzol. The hot debenzolized oil is drawn off, preferably by gravity, and caused to flow first through the heater, and afterwards through a water condenser to the store-tank. The crude benzol vapours and steam are condensed in a second water condenser. The condensate flows to a receiver, whence it passes through a separator. A charge of about 1600 gallons of crude benzol is pumped daily into the intermediate still (either of the Heckmann or the Savalle type), where it is distilled by steam with the production, firstly, of commercial benzol; secondly, commercials toluol; thirdly, residual xylol and heavier oils. The commercial benzol is mixed with the wash oil, together with an additional quantity corresponding to the amount of toluol, etc., permanently removed from the gas. The commercial toluol is re-distilled in a second still of the Heckmann or Savalle type, in a central works, for the production of pure toluol. If the wash oil contains much naphthalene, it may be necessary to return the xylol to the gas, to prevent naphthalene stoppages in the district services. Gas oil will probably prove the most suitable oil for washing purposes, as it is generally ready to hand, contains no naphthalene, and readily absorbs crude benzol. The oil may be worked up to a high degree of saturation without appreciable loss of toluene; a considerable proportion of the benzene, which is more difficult to catch, going forward in the gas.

Phenol from chlorobenzene; Preparation of —— K. H. Meyer. Chem.-Zeit., 1914, **38**, 1049.

PHENOL is formed when chlorobenzene is treated with strong alkalis in an autoclave under a pressure of 200 to 300 atmospheres, the yield being about 96% of that required by theory.—W. P. S.

Nitro-compounds; Precautions in the industrial preparation of —— [*in Germany*]. Chem.-Zeit., 1914, **38**, 1248. (See also this J., 1914, 376, 712).

THE following provisions are to be officially enforced in the construction of all German works for the manufacture of nitrobenzene and similar products: (1) Undue accumulation of material and crowding of the working staff must be avoided. (2) Large quantities of the raw materials must not be brought into reaction simultaneously: the nitrating apparatus should be examined methodically each time before use, since, for instance, the unsuspected presence of acid may lead to accidents. (3) Isolation of the various parts of the apparatus is desirable. (4) The nitrating apparatus must be provided with an outlet capable of conducting the appreciable amounts of hydrocarbon which may be generated to a sufficient height above the roof. (5) Precautions must be taken not to introduce the acid until the stirrer has been set in motion. (6) Some device must be adopted to show that the liquid is in motion. (7) In continuous working, *i.e.*, when measured quantities of nitrating acid and hydrocarbon are allowed to interact, certain modifications of these rules are permissible.—J. R.

Comparative toxicity of coal tar creosote and creosote distillates and of individual constituents for the marine wood borer, Xylotrya. **Shackell.** *See* I.

Recovery of naphthalene from pastes for the manufacture of artificial coal. **Mayer.** *See* IIA.

PATENTS.

Petroleum and its distillates [and lignite tar oils]; Purification of —— especially to separate aromatic and unsaturated heavy hydrocarbons. Allgemeine Ges. f. Chem. Industrie m. b. H. Ger. Pat. 277,288, Nov. 15, 1912. Addition to Ger. Pat. 216,459.

THE process of refining petroleum or its distillates by treatment with liquefied sulphur dioxide, described in the chief patent (this J., 1910, 144) is, according to the present patent, applied to lignite tar or tar oils. By treating in this way the fraction from lignite tar known as gas oil, the aromatic hydrocarbons are removed, and a residue is left which gives a larger yield of gas of better quality than that obtained from the untreated oil. In a similar manner the solar oil fraction yields a product which requires much less sulphuric acid when treated for the production of colourless vaseline oil.—A. S.

Treating [hydrocarbon] oil [to remove water]. U.S. Pat. 1,123,502. *See* IIA.

Process for obtaining light hydrocarbons from heavy hydrocarbons. Fr. Pat. 470,551. *See* IIA.

IV.—COLOURING MATTERS AND DYES.

British dyes.

A circular has been issued by the Committee appointed by users of dyes (see this J., 1915, 73), giving fuller details of the modified scheme for the manufacture of dyestuffs in Great Britain (see this J., 1915, 133). The capital will be issued in shares of £1 each, of which 2s. 6d. will be payable on application and 2s. 6d. on allotment. The subscription of the share capital is invited from users of dyes and all others directly or indirectly interested. Calls will, if found necessary, be made from time to time, at intervals of not less than three months, and of not more than 5s. per share, but it is believed that, with the Government assistance, payments beyond the 5s. payable on application and allotment will not be needed for some time. The terms of the agreement with users have now been modified so that no user signing it will be obliged to take the company's products unless they are "of good quality and suitable for the purposes of the customer's business and at reasonable prices," while in the event of dispute as to what are "reasonable prices," the question shall be referred to a referee, who shall "have regard to all the circumstances, including the fair current prices at which dyes are being sold by other suppliers." It is believed that these modifications will remove the opposition to the agreement previously submitted for signature. The directors will, in the first place, consider the purchase of the business of Read Holliday and Sons, Ltd., for which an option has been obtained, and they will continue negotiations with other dye-producing firms. Negotiations have taken place with the Société pour l'Industrie Chimique à Bâle and the Clayton Aniline Co. (which is owned by the Société), and it is believed that arrangements can be made to purchase from the latter undertaking and to secure a supply of dyes from Switzerland on a considerable scale, which will go far in relieving the situation.

The Articles of Association of the company will contain powers to appoint a committee of experts conversant with the dyeing trade and its wants, to advise the directors what dyes are to be made, and where, and in what quantities. The agreements for the company to take over existing dye undertakings will provide for the retention of their respective chemists and staffs by the new company. Until the company is in a position to supply all the dye requirements of the country, those dyes which it can manufacture will be primarily appropriated for supplying the wants of those shareholders who have entered into contracts to take the dyes. A print of the revised form of agreement is appended to the circular. The offices of the Committee are at 7, Norfolk Street, Manchester.

PATENTS.

Colouring matters of the Diamine Green class; Process for preparing new ——. L. Cassella und Co. Fr. Pat. 470,390, June 13, 1913.

DYESTUFFS of the Diamine Green series, not affected in shade by copper, are produced from diamines, such as benzidine and tolidine, employing 2-naphthylamine-4.8-disulphonic acid as middle component.—G. H. F.

Vat dyestuffs of the naphthalene series. Badische Anilin und Soda Fabrik. Fr. Pat. 470,560, April 6, 1914. Under Int. Conv., June 13 and 25, 1913.

SEE Ger. Pats. 276,357 and 276,358 of 1913; this J., 1914, 1045. Halogen derivatives of these dyestuffs are obtained by using halogenated naphthalene-1.8-dicarboxylic acid imines or the products obtained by treating halogenated acenaphthenequinones with hydroxylamine, or by treating with halogens the dyestuffs already described.

Vat dyestuffs of the naphthalene series. Badische Anilin und Soda Fabrik. First Addition, dated April 7, 1914, to Fr. Pat. 470,560, April 6, 1914. Under Int. Conv., Oct. 9 and 20, 1913.

SEE Ger. Pat. 276,956; this J., 1914, 1084. The dyestuffs may be halogenated, yielding new vat dyestuffs producing yellowish red shades.—G. H. F.

Ureas and thioureas of 3-aminobenzoylorthobenzoic acid and of acids of the anthraquinone series, and their derivatives. Act.-Ges. f. Anilinfabr. Fr. Pat. 470,562, April 6, 1914. Under Int. Conv., June 30 and Oct. 13, 1913.

SEE Eng. Pat. 8917 of 1914; this J., 1914, 826. The corresponding thioureas are obtained by substituting carbon bisulphide or thiophosgene for the phosgene.

Blue [sulphide] dyestuffs for wool; Manufacture of ——. Kalle und Co. A.-G. Fr. Pat. 471,230, April 22, 1914. Under Int. Conv., June 17, 1913, and March 21, 1914.

COLOURING matters dyeing wool blue from an acid bath are obtained by fusing 1-aminonaphthalene-4.8-disulphonic acid, or 1-aminonaphthalene-4.6.8-trisulphonic acid, with sulphur in presence of an alkali. The reaction product is treated with water, and reducing substances (sulphides, etc.) are removed by precipitation or by a current of air after acidifying. The colouring matter is then separated by making the solution neutral or alkaline, heating, and treating with a current of air.—G. H. F.

Azo dyestuffs: Production of new ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 471,284, April 23, 1914. Under Int. Conv., May 3, 1913.

NITROAMINES or monoacidyl derivatives of diamines, or their substitution products or sulphonic acids are diazotised and combined with α-naphthylamine or its derivatives, the products are rediazotised and combined with resorcinol, and the acidyl group is removed by saponification or the nitro group is reduced. The dyestuffs thus obtained dye cotton blue shades fast to light and rendered fast to washing by after-treatment with formaldehyde.—G. H. F.

Condensation products from the arylamides of 2.3-hydroxynaphthoic acid and formaldehyde, and azo dyestuffs therefrom, and process of making same. A. Zitscher, F. Kunert, and E. Acker, Offenbach on the Maine, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,122,564, Dec. 29, 1914. Date of appl., April 17, 1914.

SEE Eng. Pat. 3314 of 1914; this J., 1914, 855.

Vat colouring matters and process of producing them. E. Münch, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,122,790, Dec. 29, 1914. Date of appl., Aug. 13, 1912.

SEE Eng. Pat. 2346 of 1912; this J., 1912, 1025.

Anthraquinone derivatives [dyestuffs]; Badische Anilin und Soda Fabrik. Fr. Pat. 471,117, April 18, 1914. Under Int. Conv., Aug. 11, 1913.

SEE Eng. Pat. 21,027 of 1913; this J., 1914, 544.

Wool dyestuffs; Red ——. W. Tropp, Assignor to Farbw. vorm. Meister, Lucius, und Brüning, Hoechst on Maine, Germany. U.S. Pat. 1,123,430, Jan. 5, 1915. Date of appl., Feb. 18, 1914.

SEE Fr. Pat. 468,218 of 1914; this J., 1914, 957.

Azo dyestuffs; Manufacture of new ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 470,670, April 8, 1914. Under Int. Conv., May 2 and Aug. 4, 1913.

SEE Ger. Pats. 276,140, 276,141, and 276,142 of 1913; this J., 1914, 855.

Dyestuffs derived from coal tar; Process for preventing the volatilisation of powdered ——. L. Cassella und Co. Fr. Pat. 471,243, July 4, 1913.

SEE Ger. Pat. 274,642 of 1914; this J., 1914, 827.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Paper, pasteboard and cardboard. Board of Trade Bulletin. No. 90.

THE value of the exports of paper, pasteboard, and cardboard from Germany in 1912 was £5,272,300; from Austria-Hungary (1913), £1,054,860; and from United Kingdom (1913), £2,758,700. German exports of paper, cardboard, etc., to Austria-Hungary in 1912 were valued at £256,600, and to the United Kingdom £1,286,600. Austrian exports in 1913 to Germany were valued at £229,500, and to the United Kingdom at £43,300, while the exports of the United Kingdom in the same year to Germany and Austria-Hungary were valued at £81,600 and £7100, respectively. The exports to the principal Colonial and neutral markets were: from Germany (1912), £3,602,850; from Austria-Hungary (1913), £770,055; and from United Kingdom (1913), £2,488,357.

The German exports (1912) to the principal Colonial and neutral markets included: glazed board (pressing board) and other highly glazed pasteboard, imitation leather-board, and other fine pasteboard, £28,200; vulcanised fibre, £6200; pasteboard of wood-pulp (imitation leather-board), straw-board, wrapper-board, peat-board, and other coarse pasteboard, not otherwise mentioned, £151,300; pasteboard impregnated with asphalt, etc., for roofing, also tubes thereof, carton-pierre, ship felt for caulking, £102,650; pasteboard of all kinds coated with white or colours with paper pasted on, varnished, bronzed, coated with wool flocks, etc., with impressed patterns (Lignomur), etc.; painters' boards, £51,600; packing paper of all kinds, including tissue paper weighing more than 30 grms. per sq. metre, and yellow straw paper, £707,450; printing paper, undyed or dyed in the pulp, £630,100; cardboard (thin cardboard), except drawing cardboards, £274,800; parchment paper. £66,900; paper and cardboard, covered with spun material, or with foundation or layers of such or of wire gauze, £28,750; wall-paper, wall-paper borders of paper, £375,000; slate paper and slates thereof, not combined with other materials, smoothing and polishing paper, £45,100; gelatin paper, tracing paper, blue paper, fly-paper, moth-paper, ozone-paper, test (litmus and other chemical) paper, etc., £108,250; tissue paper (except that used for packing), £97,700; crude photographic paper, not treated with baryta; felt paper, and wall-paper, £272,650; coloured paper, including paper coated with chalk, etc., or with metal impressions, £440,350; lacquered paper, paper coated with scales of mica or glass, pounce, wool flock and the like; paper provided with metallic coatings, such as gilt or silver edged paper, £70,150; paper and cardboard, punched or stamped out, £145,700.

The Austro-Hungarian exports (1913) to the principal Colonial and neutral markets included: pasteboard, common, weighing 300 grms. or more per sq. metre: pasteboard of wood-pulp, £177,300, other common pasteboard, including rough rag pasteboard and strawboard, £4010; pressing boards, slate board, glazed boards of pasteboard, £955; fine cardboard (cartons), £3250; all other cardboard (mainly tarred cardboard and carton-pierre), £8415; packing paper, weighing 30 grms. or more per sq. metre, not dyed, £173,485, dyed in the pulp or tarred, £41,995; drawing paper, artists' boards, copper-plate printing paper, £4485; coloured paper, also lacquered and white-coated paper, plain, £31,410, with impressed designs, marbled, or goffered, £1455; parchment paper, £985; lace paper and similar perforated paper, £1185; wall-paper, £1595; printing paper, plain, ungummed, £110,680; cigarette papers in sheets, plain, £98,070, ribbed £28,840.

The United Kingdom does the bulk of the trade in our big Colonial markets, though German competition is noticeable in Australia and British India. In the latter market Austrian competition is also in evidence. In France, China, and Japan the exports of the United Kingdom are about equal to those of Germany and Austria-Hungary combined. Elsewhere the position of the United Kingdom is generally inferior to that of Germany, particularly in the western European markets, Switzerland, Spain, Italy, Russia, Brazil, Argentina, United States, Mexico, and Cuba, while in Italy, the Balkan States, Turkey, and Egypt British trade is markedly inferior to that of Austria-Hungary.

PATENTS.

Artificial silks; Manufacture of ——. H. Davoine. Fr. Pat. 470,606, April 7, 1914.

CELLULOSE obtained from *Hedychium coronarium* is employed for the manufacture of artificial silks. —J. F. B.

Cellulose esters and acetates and articles, such as films, prepared therefrom; Manufacture of ——. Fabriek van Chemischen Producten. Fr. Pat. 470,384, April 1, 1914.

AIR-DRY cotton, 106 grms., is treated with a mixture containing approximately 240 grms. of acetic anhydride, 400 of acetic acid and 15 of acetylsulphuric acid (see Fr. Pat. 461,539; this J., 1914, 219). When the combined acetic acid

amounts to 56—62% of the dry weight of the product, the mixture is treated with 40 c.c. of 10% aqueous sulphuric acid and any sulphuric acid remaining in combination with the ester is eliminated by digesting at 40° C. for about 12 hours. The product should be a mixture of cellulose tri- and di-acetates, giving viscous solutions with acetone and capable of withstanding 200° C. without decomposition.—J. F. B.

Nitrocellulose and cellulose acetate; Manufacture of products for rendering —— plastic. C. Shrager and R. D. Lance. Fr. Pat. 470,726, June 21, 1913.

THE products consist of mixtures of one or more metallic resinates, insoluble in water, and one or more glyceryl esters, which, when incorporated with a cellulose ester, give a plastic composition the properties of which can be varied according to the proportions and nature of the resinates employed. Example: 170 grms. of rosin are dissolved in 500 c.c. of benzene and the solution is shaken for several hours with 17 grms. of zinc oxide and 3 of aluminium oxide. To the solution of mixed resinates, 30 grms. of triacetin is added and the solvent is evaporated. A mixture of equal parts of the plastic product and nitrocellulose possesses properties analogous to those of camphor-celluloid.—J. F. B.

Cellulose acetate and its transparent derivatives; Application of —— [in aviation and aeronautics]. M. M. J. Bouffort. Fr. Pat. 470,897, June 26, 1913.

THE portions of the structure of aviation and aeronautical apparatus which are usually opaque are, where possible, constructed of a transparent composition having a cellulose acetate basis, in order to enlarge the field of vision and render the machine less visible.—J. F. B.

Cellulose acetates; Manufacture of infusible ——. Verein f. Chem. Ind. in Mainz. Fr. Pat. 470,963, April 11, 1914. Under Int. Conv., April 14, 1913.

CELLULOSE acetates characterised by their infusibility and the exceptional viscosity of their solutions are prepared by the acetylation of perfectly anhydrous cellulose: 30 kilos. of cotton is digested in a mixture of 60 kilos. of acetic anhydride and 100 of glacial acetic acid at 50°—100° C. for several hours or at the ordinary temperature for a few days; when the moisture is completely eliminated, a catalytic agent is added, preferably dissolved in a further quantity of acetylating mixture, and acetylation is performed in the usual manner.—J. F. B.

Wood pulp, straw pulp, and the like; Process for bleaching and removing resin from mechanical ——. Aflenzer Graphit- und Talksteingewerkschaft G. m. b. H. Ger. Pat. 277,385, Oct. 21, 1913.

THE material is treated cold with finely-divided talc in vessels provided with agitators.—A. S.

Fibres; Treatment of —— to increase their coefficient of friction. W. E. Muntz. Fr. Pat. 470,957, April 6, 1914. Under Int. Conv., April 8, 1913.

SEE Eng. Pat. 8278 of 1913; this J., 1914, 546.

Manufacture of lacquers containing cellulose derivatives Fr. Pat. 471,104. *See* XIII.

Preparation of nitrocelluloses rich in nitrogen and easily stabilised. Fr. Pat. 470,743. *See* XXII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing; Theory of ——. IV. W. D. Bancroft. J. Phys. Chem., 1915, 19, 50—64. (See also this J., 1914, 197, 349, 589.)

THE general conclusion reached by the author is that adsorption, rather than the formation of definite compounds, plays the chief part in the practice of dyeing. Tannin is adsorbed in acid solution by wool and cotton, the amount of adsorption depending upon the specific nature and the concentration of the acid. Similarly, oil mordants are adsorbed by cotton without the formation of definite compounds. Alizarin is adsorbed by chromium mordant, and the balance of the experimental evidence indicates similar behaviour towards ferric mordant. Alumina adsorbs Crystal Ponceau at the ordinary temperature, although at 90° C. a definite compound appears to be formed. Alumina also adsorbs Fast Green, Acid Green, Acid Violet, Croceine Orange, Alizarin Yellow, and Fast Blue: the presence of sodium sulphate decreases the amount of adsorption in these cases. The same mordant adsorbs the blue form of Congo Red, and possibly stabilises the red form (cf. Blucher and Farnau, this J., 1914, 1085). Although a definite crystalline copper eosinate has been prepared (Gilbert, this J., 1914, 1199), the lakes given by Eosin with copper salts, magnesia, etc., are undoubtedly adsorption products. Silica, according to its previous treatment, adsorbs differing amounts of Methylene Blue, and various basic dyes are adsorbed by tannin. In general, the mordanting of basic colours by acid colours, and *vice versâ*, and the formation of colour lakes are examples of adsorption, although definite compounds may sometimes be produced under special conditions. In most cases, also, fixing agents are regarded as colloids of opposite sign to the mordants. Tin phosphate and ferric arsenate, respectively, are not formed when stannic acid is treated with phosphoric acid and when ferric oxide is treated with sodium arsenate; and it is probable that aluminium phosphate, silicate, oleate, etc., are not produced under the ordinary conditions which prevail in practice. The nature of the action of lime on alizarin with alumina mordant is doubtful, but the lime probably inhibits the peptonisation of the alumina. Adsorption occurs between tannin and antimony salts and probably also between oil mordants and iron salts, although definite oleates are sometimes produced.—J. R.

PATENTS.

Mercerising, dyeing, or bleaching of cotton in the sliver or roving. The British Cotton and Wool Dyers' Association, Ltd., Manchester, and J. H. Robson, Huddersfield. Eng. Pat. 708, Jan. 10, 1914.

A STOUT thread or string is wound spirally around the sliver or rovings to be mercerised, dyed, or bleached, or the sliver may be coiled around the thread, so that the fibres may be fully extended without injury.—B. N.

Dyeing coarsely or finely powdered vegetable or animal materials; Process for ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 470,408, April 1, 1914. Under Int. Conv., April 25, 1913.

SAWDUST, leather waste, or powdered cork is dyed by projecting a strong solution of dyestuff on to the material while in motion, *e.g.*, in a rotating drum.—G. H. F.

Hank dyeing; Process of ——. H. Krantz. Fr. Pat. 470,734, April 9, 1914. Under Int. Conv., April 10, 1913.

HANKS are dyed in a vat connected with a pump by which the liquor can be circulated alternately in opposite directions. The hanks are suspended freely on rods, the middle portion resting on the rod, with the ends hanging down in loops on either side, and a wooden board is placed a short distance above to keep the hanks in position when the liquor is circulated upwards through the vat.—G. H. F.

Dyeings on the fibre; Production of —— by the single bath method. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 471,123, April 18, 1914. Under Int. Conv., Aug. 25, 1913.

THE material is padded or printed with a solution of an arylamide of 2.3-hydroxynaphthoic acid together with a salt of a nitrosamine. With or without previous drying, the colour is developed by passing through a dilute acid bath or through a dilute solution of a bichromate. Fast red shades are produced.—G. H. F.

Furs; Process for decolorising ——. A. Lafon. Fr. Pat. 470,940, June 27, 1913.

SKINS are coated on the flesh side with vaseline or the like, and the fur is brushed over with a mordant consisting of copper sulphate, tartaric acid, and potassium bichromate (three parts of each per thousand of water), and after drying, treated with hydrogen peroxide, first of 20-vol., then of 12-vol. strength. The skins are dried until they have acquired the desired shade, washed with water, and freed from grease by means of mahogany sawdust at 35°—40° C.
—G. H. F.

Cotton fabrics; Treatment of —— to impart thereto a character resembling wool and also pattern effects. Heberlein und Co., Wattwyl, Switzerland. Eng. Pat. 12,559, May 21, 1914. Under Int. Conv., Dec. 5, 1913.

SEE Fr. Pat. 468,821 of 1914; this J., 1914, 959.

Dyeings on cotton; Process of producing ——. H. Eichwede, Assignor to Farbw. vorm. Meister, Lucius, und Brüning, Hoechst on Maine, Germany. U.S. Pat. 1,123,263, Jan. 5, 1915. Date of appl., April 8, 1913.

SEE Fr. Pat. 455,493 of 1913; this J., 1913, 940.

Finishing, weighting, coating, or sizing [textiles]. L. Lilienfeld. First Addition, dated March 20, 1914, to Fr. Pat. 436,087, Nov. 8, 1911. Under Int. Conv., April 8, 1913.

SEE Eng. Pat. 7317 of 1914; this J., 1914, 747.

[Perborate] washing [and bleaching] compounds. Eng. Pat. 24,625. *See* VII.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

German sulphuric acid industry; Effects of the war upon the ——. K. Reusch. Chem.-Zeit., 1914, 38, 1241—1243.

THE export of sulphuric acid, sulphuric anhydride, and sulphurous acid from Germany is now prohibited. The total German production of sulphuric acid in 1912 was 1,649,681 metric tons, calculated as monohydrate; and in 1913 the imports exceeded the exports by 65,289 metric tons, most of the imports being from Belgium. Of the requisite pyrites, over 80% was imported, mainly from Portugal, Spain, and France. The working of the considerable German deposits might present difficulty owing to scarcity of labour. Norway is indicated as a further possible source of supply. Very similar conditions exist for zinc blende, of which about 60% was imported from Australia alone. The importation of native sulphur from Italy is at present costly. No data are available respecting the amounts of nitre and nitric acid used in the manufacture of sulphuric acid, but in 1911 the contact process was employed in 7 works, the chamber process in 86, and both processes in 17. The price of nitre has risen, and in discussing sources of such material, reference is made to the Norwegian production and the present strenuous German efforts to convert ammonia into nitric acid on a large scale. In view of the increased demand for sulphuric acid in manufacturing explosives the price has risen slightly, and it is recommended that some economy should be made in the superphosphate industry, for which 600,000 metric tons of acid was used in 1909: such economy would be facilitated by the increased output of Thomas slag due to the expansion of the iron industry. A further economy is possible through the diminished activity of the dye, glass, and other factories.—J. R.

Alums; Separation of —— into their components. B. Haas. Chem.-Zeit., 1914, 38, 993.

TAKING potassium chrome alum as an example, the solution is stirred gradually into a paste of an equivalent amount of finely-divided calcium carbonate with boiling water; the reverse method of mixing is, however, preferable if an acid-proof vessel is available. When effervescence has ceased the finely-divided precipitate of calcium sulphate and hydrated chromic oxide is allowed to settle for 2 hours, and the supernatant solution of potassium sulphate decanted. After one washing with water the chromium is removed from the precipitate by treatment either with acid or alkali. Alternatively, a dry mixture of alum and calcium carbonate may be heated and extracted with water.—J. R.

Sodium metasilicate-enneahydrate, a well-defined, crystallised sodium silicate. K. A. Vesterberg. Z. anorg. Chem., 1914, 88, 341—348.

CRYSTALLOGRAPHIC measurements of the hydrate, $Na_2SiO_3.9H_2O$, previously described (this J., 1912, 874), show it to be identical with the product obtained by Fritzsche by adding silica to concentrated caustic soda solution (Pogg. Ann., 1838, 43, 135). The salt is now made commercially in Sweden.—F. SODN.

Ammonium perhaloids. F. D. Chattaway. Chem. Soc. Trans., 1915, 107, 105—108.

AMMONIUM perhaloids were prepared by adding two equivalents of halogen to a concentrated aqueous solution of a normal ammonium salt and crystallising in a desiccator over sulphuric acid. Ammonium tribromide, dichloriodide, and chlorobromo-iodide are described as remarkably stable substances which can be kept without change for years, but when heated in air, or exposed over lime in a vacuum, they are converted into the monohalogen salt. In this property, and in their extreme solubility in water they differ entirely from the diazonium trihaloids and they cannot be regarded as possessing an analogous constitution. The latter are N-trihalogen derivatives of the hydrazines, $C_6H_5Nhal.\text{-}Nhal._2$, whilst ammonium trihaloids may be provisionally regarded as having the constitution, $NH_4.hal.\begin{matrix}hal.\\ \|\\ hal.\end{matrix}$ —G. F. M.

Iron and free sulphuric acid; Reduction of ferric sulphate in acid solution by means of cadmium amalgam for titration of ——. [*Analysis of mine waters.*] J. H. Capps and O. W. Boies. J. Phys. Chem., 1915, **19**, 65—75.

FREE sulphuric acid in mine water cannot be determined directly owing to gradual hydrolysis of the ferric salt during the titration. Electrolytic reduction of the ferric salt invariably resulted in the liberation of measurable amounts of hydrogen: this source of error was avoided by reducing with cadmium amalgam in an atmosphere of hydrogen. A portion of the mine water (50 c.c.) was first titrated with potassium permanganate (1 c.c. = 0·005258 grm. Fe) for ferrous iron. A small separating funnel and a three-way tap were sealed to the central tube and side tube, respectively, of a Drexel gas-washing bottle, and after introducing a convenient amount of the mine water and exhausting, the bottle was well shaken; hydrogen was admitted and the bottle again shaken till equilibrium resulted. The process was repeated twice, the amalgam run in, and the bottle shaken vigorously until the attainment of complete reduction, *i.e.* till a drop of the solution gave no colour with potassium thiocyanate (about two minutes). One aliquot part of the solution (50 c.c.) was then titrated with *N*/10 sodium carbonate for free acid, and another portion (50 c.c.) with permanganate for total iron. Methyl orange indicator was employed in the former operation, the end-point being ascertained by comparison with a standard neutral tint. The absolute end-point of the standard was ascertained by conductivity measurements made during titration of a similar solution in presence of methyl orange; the resulting tint was permanent when the solution was enclosed in a sealed bulb of clean glass. An artificial "mine water" containing 0·429 grm. of ferric iron, 0·774 grm. of ferrous iron, and 3·85 grms. of sulphuric acid per litre, also traces of aluminium, calcium, magnesium (as sulphates) and sodium (as chloride) gave, respectively, on analysis by the above method 0·427 grm., 0·769 grm., and 3·825 grm. Similar solutions of ferric iron in sulphuric or hydrochloric acids, after reduction (4 to 5 minutes) in the same way with cadmium amalgam gave extremely concordant results upon subsequent titration with permanganate and bichromate, respectively. In these cases the preliminary expulsion of oxygen from the solutions was unnecessary, but the air in the apparatus was displaced by carbon dioxide. Zinc amalgam effected a rapid reduction (0·5 minute), but the results were vitiated by the simultaneous displacement of appreciable amounts of iron from the solutions.—J. R.

Conductivity of solutions of certain electrolytes in organic solvents; The electrical ——. J. N. Pearce. J. Phys. Chem., 1915, **19**, 14—49.

ELECTROLYTES dissolved in aniline exhibited three kinds of behaviour upon progressive dilution. With silver nitrate, aniline hydrobromide, aniline hydrochloride, ammonium thiocyanate, and lithium iodide the molecular conductivity decreased to a minimum and then increased normally; the values for mercuric iodide increased normally; and tetra-ethylammonium iodide showed an increase to a maximum, followed by a rapid decrease to a minimum and a final normal increase. With the first three solutions the temperature coefficients also decreased with dilution of the solutions and reached a minimum value at the dilutions corresponding to the minimum molecular conductivities; ethylaniline hydrochloride, on the contrary, showed a maximum temperature coefficient at this point; and the temperature coefficient of mercuric iodide increased and that of tetra-ethylammonium iodide decreased with increasing dilution. In quinoline, which has a higher dielectric constant than aniline, higher molecular conductivities were given by silver nitrate and aniline hydrobromide, and the minimum values were displaced toward the region of higher concentration. It is suggested that, generally, in dilute solutions of the kind examined, the molecular conductivity and hence the dissociation of the electrolyte increases with increasing dielectric constant of the solvent. Similar measurements made for fourteen metallic salts in pyridine solution resulted in the following being classified as "strong," *i.e.*, as possessing large dielectric constants and ionizing tendencies; silver nitrate, lithium iodide, sodium iodide, potassium and ammonium thiocyanates, and copper nitrate. The "weak" salts were lithium chloride, lithium bromide, mercuric chloride, bromide, and iodide, cupric chloride, cobalt chloride, and cadmium nitrate. Twelve of these salts gave minimum values for the temperature coefficients: copper nitrate gave steadily increasing and lithium chloride steadily decreasing values upon dilution. Negative temperature coefficients were observed for solutions of sodium iodide, lithium bromide, cobalt chloride, and cadmium nitrate. The mercuric salts gave minimum values for the molecular conductivity; but in all the other cases the values increased steadily with increasing dilution.—J. R.

German Potash Syndicate; Sales of the —— during 1914. Board of Trade J., Feb. 11, 1915.

ACCORDING to the "Börsen-Zeitung" (Berlin) of Jan. 22nd, the sales of the German Potash Syndicate in 1914 amounted to about £78,000,000 as compared with £96,000,000 in the previous year. It was hoped that the total for 1914 would amount to £105,000,000. The general expenses of the works, including raw materials, have risen considerably, and competent workmen are difficult to obtain.

Bromine; Solutions of —— in water, nitrobenzene, and carbon tetrachloride. A. F. Joseph. Chem. Soc. Trans., 1915, **107**, 1—7.

THE molecular solution volume of bromine in water, nitrobenzene, and carbon tetrachloride in concentrations up to 60 grms. per litre increases in each case to a maximum, the value of which increases in the order named. The colour intensity in the three solvents also increases in the same order; the colour of the carbon tetrachloride solution is the same as that of bromine vapour of the same concentration, of the nitrobenzene solution about two-thirds of this, and of the aqueous solution from one-half to one-third. Bromine evaporates from aqueous solution about twelve times as fast as from carbon tetrachloride and about twenty-four times as fast as from nitrobenzene.—G. F. M.

Nitrogen; Spectroscopic investigations in connection with the active modification of ——. *IV. A band spectrum of boron nitride.* W. Jevons. Roy. Soc. Proc., 1915, A. **91**, 120—134. (See also this J., 1913, 750; 1914, 548.)

BORON trichloride, prepared by passing chlorine over heated, amorphous boron, was collected in a cooled vessel containing mercury, and purified by fractionation. The interaction of active nitrogen and boron trichloride or methyl borate developed a band spectrum extending from λ 6371 to at least λ 2140. The spectrum consisted of two distinct systems; in the less refrangible one, each band consisted of four heads, whilst the more refrangible system had single heads like the silicon nitride spectrum. The origin of the spectrum was found to be boron nitride, the bands of the latter, like those of cyanogen, being also produced in the electric arc spectrum of boron in air or nitrogen,

where they occurred together with bands of the oxide. Boron, carbon, and silicon compounds all develop nitride spectra in the nitrogen afterglow.—O. R.

Lead acetate test for hydrogen sulphide in gas. McBride and Edwards. *See* IIA.

Hermann's phenomenon. Walpole. *See* XI.

PATENTS.

Nitric and sulphuric acids; Process of producing ——. C. C. Meigs, Charleston, S.C. U.S. Pat. 1,120,960, Dec. 15, 1914. Date of appl., Oct. 18, 1913.

A MIXTURE of nitrogen and sulphur dioxide is produced by burning sulphur, the nitrogen is combined with hydrogen to form ammonia, and the latter is oxidised to dilute nitric acid. The sulphur dioxide is oxidised to sulphuric anhydride, which is introduced into the dilute nitric acid to give concentrated nitric acid and dilute sulphuric acid, and the nitric and sulphuric acids are separated.—F. SODN.

Ammonia; Process of producing ——. S. Peacock, Chicago, Assignor to International Agricultural Corporation, New York. U.S. Pat. 1,092,167, April 7, 1914. Date of appl., Dec. 10, 1912.

A HIGHER hydride of iron (*e.g.*, FeH_3), which may be prepared by treating spongy iron with hydrogen, is exposed, preferably in a thin layer, to the action of nitrogen, free from oxygen or readily reducible oxygen compounds, at a temperature at which nascent hydrogen is produced from the hydride and combines with the nitrogen to form ammonia, which is collected, and hydrogen is simultaneously supplied, to re-convert the lower hydride of iron continuously into the higher hydride.—F. SODN.

[Perborate] washing [and bleaching] compounds. J. T. Freestone, and W. and F. Walker, Ltd., Liverpool. Eng. Pat. 24,625, Oct. 30, 1913.

A COMPRESSED tablet coated with wax and containing a perborate which evolves oxygen when added to warm water. Suitable ingredients are soap (35%), sodium carbonate (50), sodium perborate (8), ammonium carbonate (5), and paraffin wax (2%).—F. SODN.

Cream of tartar; Manufacture of ——. J. B. Moszczenski, New York, Assignor to Tartar Chemical Co., Jersey City, N.J. U.S. Pat. 1,120,839, Dec. 15, 1914. Date of appl., Jan. 28, 1911.

MATERIAL containing potassium bitartrate is treated at a high temperature with a solution of a salt, *e.g.*, sodium acetate, which increases the solvent action of water for the bitartrate, and the solution is cooled to effect crystallisation. —F. SODN.

Salt; Method and apparatus for mining ——. C. S. Bradley, New York. U.S. Pat. 1,121,225, Dec. 15, 1914. Date of appl., Nov. 18, 1913.

SALT solution is circulated from the surface to the salt deposit through pipes, arranged in the form of a heat exchanger, and the solution in the salt deposit is heated by means of steam introduced through a separate bore-hole. Means are provided for cooling the solution at the surface to induce crystallisation of the salt.—F. SODN.

Salt; Production of blocks of ——. T. Lichtenberger and G. Kassel. Ger. Pat. 276,666, April 24, 1913. Addition to Ger. Pat. 265,586 (see Eng. Pat. 8903 of 1913; this J., 1913, 867).

ONE of the side walls of the melting furnace does not extend to the base, but rests on a metal angle plate, the vertical portion of which is in contact with the bath of fused salt. The salt is tapped off through an opening in this plate.—A. S.

Potash; Extraction of —— [as nitrate] from salt deposits and saline solutions. M. E. Pichard. Fr. Pat. 471,237, July 4, 1913.

POTASSIUM nitrate is obtained from solutions containing potassium chloride by the action of sodium nitrate at about 0° to 3° C. The theoretical yield is obtained by adding, during the cooling, a quantity of anhydrous sodium sulphate, which withdraws water from the solution and renders the potassium nitrate insoluble.—B. N.

Rare-metal [vanadium] oxides; Process for securing the precipitation of the ——. R. S. Davis, Newmire, Colo., Assignor to Primos Chemical Co., Primos, Pa. U.S. Pat. 1,119,929, Dec. 8, 1914. Date of appl., Feb. 19, 1913.

AN acidified and heated solution of a rare metal, such as vanadium, is subjected to pressure, for example, to a pressure of about one ounce above that of the atmosphere.—F. SODN.

Zinc oxide; Continuous process of obtaining ——. E. Hunebelle. Fr. Pat. 470,321, June 12, 1913.

IMPURE zinc oxide, industrial zinc residues, etc., are treated with hydrochloric acid, any lead, iron, or metals precipitable by calcium carbonate are separated, and zinc oxide or carbonate is precipitated from the filtrate by the addition of magnesium oxide or carbonate. The filtered solution is concentrated until $MgCl_2,6H_2O$ separates, and this is heated first to 250° C., and then in a current of steam to about 600° C., the resulting vapours of hydrochloric acid being condensed, while a residue of pure magnesium oxide is left.—C. A. M.

Nitrogen; Method of fixing —— [to form a cyanogen compound]. J. E. Bucher, Coventry, R.I., Assignor to Nitrogen Products Co., Providence, R.I. U.S. Pat. 1,120,682, Dec. 15, 1914. Date of appl., Nov. 7, 1913.

A POROUS mass of briquetted material, containing carbon, an element capable of acting as the base of a cyanogen compound under the prevailing conditions, and another element capable of dissolving carbon, the latter being disposed so as to present an extended catalytic surface, is heated preferably to about 1000° C. throughout a reaction zone, and a current of gas containing free nitrogen is passed through the pores of the material. The formation of gas channels in the reacting material may be prevented by applying pressure to it. —F. SODN.

Nitrogen compounds; [Electrical] production of ——. A. Classen. Fr. Pat. 470,916, March 28, 1914. Under Int. Conv., March 29 and 31, June 14, and Oct. 21, 1913.

THE process relates to the direct synthesis of compounds of nitrogen with hydrogen or with oxygen, by submitting mixtures of these gases to the silent electric discharge in the presence of finely-divided contact materials, between 25° and 100° C. The ammonia or nitrogen oxides formed are dissolved in water. The contact material consists of colloidal metals or alloys, containing also metallic oxides, produced by the action of gelatose, glue, albumin, etc., upon metallic salts, and deposited upon asbestos, infusorial earth, sawdust, etc. The apparatus is formed of two concentric non-conducting tubes, between which the gas is passed. The positive terminal is connected to the space between the tubes, whilst the outer tube is placed in water

connected to the negative pole. The contact material, surrounding the inner tube, is enclosed in a fabric, a space being left between the material and the inner wall of the outer tube, and the inner tube may also be provided with a platinum wire which is rendered incandescent for the formation of nitrites; the air inlet tube may be divided into several branches. The inner tube may be of metal and act as an electrode, in which case it is covered with contact material and iron wire gauze; owing to the continuous discharge of sparks in the form of brushes between the gauze and the tube, the latter becomes covered with colloidal metal in a fine state of subdivision, and this acts as the contact material.—B. N.

Nitrogen compounds; Manufacture of ——. O. Bender. Ger. Pat. 277,435, Jan. 26, 1913.

WATER is delivered continuously to the porous walls of a hermetically-closed generator-furnace. The steam, or its elements, diffuses through the walls into the furnace where the nascent oxygen and hydrogen combine with the nitrogen present in the combustion gases, whereupon the gases are suddenly cooled. The pressure within the furnace is preferably one or several atmospheres above normal, and the air used for combustion may be replaced by a mixture of oxygen and nitrogen in varying proportions according to the product desired. The process is applicable to the production of nitric oxide, ammonium nitrite and nitrate, etc.—A. S.

Marine algæ; Treatment of —— to extract their constituents [*iodine, etc.*]. M. P. P. Gloess, L. P. J. and E. R. Darrasse. First Addition, dated Feb. 20, 1914, to Fr. Pat. 470,943, June 27, 1913 (this J., 1914, 920).

MARINE algæ are treated with an oxidising agent such as hydrogen peroxide in neutral or acid solution, and the iodine is extracted from the liquid by known means. The salt solution remaining is either evaporated to obtain the mineral salts, or added to the extracted plant residue containing mineral salts, mucilaginous material, cellulose, etc., and evaporated, dried and ground. The residue may be used as a manure. As an alternative, the plants may be treated with an oxidising gas, *e.g.*, ozone or chlorine, and heated to volatilise the iodine, the extracted plant residue being afterwards dried.—B. N.

Hydrogen [*from water gas, producer gas, etc.*]; *Manufacture of* ——. J. L. Buchanan, Bromborough, and E. B. Maxted, Rock Ferry. Eng. Pat. 6476, March 14, 1914.

GASES containing carbon monoxide are passed with steam over heated catalytic material containing a lixiviated alkali ferrite, prepared, for example, by roasting a mixture of sodium carbonate and burnt pyrites at about 1000° C., and lixiviating with hot water to recover the greater portion of the caustic alkali formed.—F. SODN.

Persulphuric acid and its salts; Manufacture of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 470,264, March 30, 1914. Under Int. Conv., April 17 and Sept. 12, 1913.

SEE Ger. Pat. 271,642 and Eng. Pat. 24,931 of 1913; this J., 1914, 484, 749.

Sodium carbonate; Process for producing ——. M. Spazier, Los Angeles, Cal. U.S. Pat. 1,122,323, Dec. 29, 1914. Date of appl., June 23, 1913.

SEE Eng. Pat. 29,827 of 1913; this J., 1914, 749.

Magnesium perborate; Process of manufacturing ——. W. Weber, Assignor to Henkel und Co., Dusseldorf, Germany. U.S. Pat. 1,124,081, Jan. 5, 1915. Date of appl., Feb. 9, 1914.

SEE Eng. Pat. 3388 of 1914; this J., 1914, 961.

Chlorides of the alkali metals; Treatment of —— to obtain useful products therefrom. J. A. Kendall, London. U.S. Pat. 1,124,143, Jan. 5, 1915. Date of appl., Nov. 22, 1913.

SEE Eng. Pat. 26,896 of 1912; this J., 1914, 22.

Seaweeds; Treatment of —— to extract their constituents. M. P. P. Gloess, L. P. J. and E. R. Darrasse. Fr. Pat. 470,943, June 27, 1913.

SEE U.S. Pat. 1,103,283 of 1914; this J., 1914, 920.

Extraction of sulphur and cyanogen from the gases resulting from coal distillation. Fr. Pat. 471,234. *See* IIA.

Process of recovering alkalis from flue-gases [*of cement kilns*]. U.S. Pat. 1,121,532. *See* IX.

VIII.—GLASS; CERAMICS.

Fireproof bricks, retorts, crucibles, etc. Board of Trade Bulletin.

EXPORTS from Germany in 1912 of fireproof bricks of all kinds (Chamotte, Dinas, bauxite, etc.): (*a*) rectangular, each weighing less than 5 kilos. net, amounted to £322,900; (*b*) rectangular, each weighing 5 kilos. or more net, and other than rectangular, without regard to weight, £261,200; other fire-proof products of clay and clayey substances: retorts, £26,500; crucibles, muffles, capsules, tubes, cylinders, and other hollow articles, other than retorts; slabs and other products, except bricks; crucibles of magnesia, cement, or soapstone, £33,100; total, £643,700; from Austria-Hungary (1913)—fire-proof bricks: Dinas, magnesite, bauxite, and graphite bricks, weighing up to 5 kilos. each, £149,300: weighing over 5 kilos. each, £74,500; other, weighing up to 10 kilos. each, £15,800, weighing over 10 kilos. each, £7,000; retorts, crucibles, muffles, capsules, nozzles, brewers' stirring-rods and similar articles for technical purposes of fireproof material (other than graphite) or common stoneware, £1700; total, £248,300. Similar particulars for the United Kingdom are not available.

The principal markets (mainly European) supplied by Germany, and the amount sent to each market in 1912, were:—Russia (£156,100); France (£135,650); Belgium (£84,400); Italy (£52,000); Netherlands (£39,900); and Switzerland (£28,600). The United Kingdom took from Germany £13,800 worth of these products in 1912.

Austria's exports of fireproof bricks, etc., go principally to Russia (£42,710); France (£23,850); Italy (£17,050), United Kingdom (£16,520), and Belgium (£7430).

The maximum amount of German and Austrian trade in fireproof bricks, retorts, crucibles, etc., which might be diverted to British manufacturers under present circumstances is as follows:—In the United Kingdom market:—German trade (1912): fireproof bricks of all kinds, £8900; other fireproof products of clay, etc.: retorts, £2700; crucibles, muffles, capsules, tubes, cylinders, etc., £2200; Austro-Hungarian trade (1913): fireproof bricks—Dinas, magnesite, bauxite, and graphite bricks, £16,500; retorts, crucibles, muffles, capsules, nozzles, etc., £20. In Colonial and neutral markets:—German trade (1912): fireproof

bricks of all kinds, £518,600; retorts, £22,900; crucibles, muffles, etc., £24,850; Austro-Hungarian trade (1913): fireproof bricks—Dinas, magnesite, bauxite, and graphite bricks, £102,200; other fireproof bricks, £14,650; retorts, crucibles, etc., £220.

Patents.

Glasses; Process for the manufacture of a new series of economic ——. C. Merkl. Fr. Pat. 470,882, March 7, 1914. Under Int. Conv., March 7, 1913.

Easily fusible glasses of great fluidity are produced by incorporating fluorine compounds in the mixture and by increasing the number and quantity of the earthy and metallic bases. During fusion the materials are kept uncovered and directly exposed to heat rays, and the surface of the fusing mass is extended and its depth diminished by using a capsule-shaped vessel, lined with a resistant material or suitably cooled to minimise the corrosive action of the melt. Double pots, one inside the other, may be used, the inner being of material which is only slightly attacked, and the outer of any suitable material, *e.g.* metal. Porous glass is obtained by incorporating materials which develop gases or vapours during the fusion process, or by injecting gas or vapour into the melt. Alkali sulphates may be used in place of the carbonates in either coloured or colourless glasses, and volcanic rocks, either alone or mixed with other materials, may be used as raw materials.—W. C. H.

Glass-melting pots; The heating of —— [*in pot arches*]. C. King, Stourbridge. Eng. Pat. 5711, March 6, 1914.

Glass-melting pots are heated in a closed chamber or muffle surrounded by heating flues leading from a furnace situated beneath the muffle.—W. C. H.

Magnesium silicate; Use of hydrated natural —— for the manufacture of ceramic ware, tracing chalk, and heat insulators, fired or unfired. I. J. B. Darget. First Addition, dated April 4, 1914, to Fr. Pat. 456,459, June 25, 1912 (this J., 1913, 1011).

The addition of natural hydrated magnesium silicates to clay gives a light-coloured ceramic body which works well, does not crack or contract, and yields pottery which is only slightly porous and need be glazed only when the articles are to contain liquids.—W. C. H.

Opaquing agents for white enamel; Process of manufacturing ——. I. Kreidl, Vienna. U.S. Pat. 1,123,760, Jan. 5, 1915. Date of appl., May 29, 1912.

See Addition of June 6, 1912, to Fr. Pat. 429,665 of 1911; this J., 1912, 1181.

IX.—BUILDING MATERIALS.

Timber; Report of Committee on specifications for the preservation of treatable ——. Amer. Wood-preservers' Assoc., Chicago, Jan. 1915. [Advance proof.] 17 pages.

Seasoning.—Practically all woods can be air-seasoned except in low, humid localities. Gum wood requires very favourable conditions and, like beech, should be seasoned only in very open piles and watched very carefully for dry rot; "bluing" of sap pine during seasoning is not necessarily an indication of decay. Hardwood track sleepers should be seasoned for at least 8 (preferably 12) months, yellow pine for 4—6, and hemlock, tamarack, and jack-pine for 12 months; over-seasoning may prove detrimental with some species. For efficient subsequent treatment, air-seasoned wood should not contain more than 20% of moisture, calculated on the oven-dry weight. When artificial seasoning is necessary, the pressure in the steaming process should not exceed 20 lb. per sq. in., nor the temperature of the oil in the boiling process 220° F. (105° C.). *Preservatives.*—With coal-tar creosote, the full-cell treatment (Bethel process), absorbing 20—10 lb. of creosote per cub. ft. according as the wood is subject to attack by marine borers or only to ordinary processes of decay, is recommended for piling and other marine timbers and for permanent structures not subject to mechanical wear but situated in unfavourable localities; and the empty-cell treatment (Rueping and Lowry processes) for track sleepers used under conditions giving a mechanical life of 11—15 years, and for structures of limited life or subject to superficial mechanical wear and exposed mainly to the destructive action of the weather: the depth of penetration should be the same in both treatments, but in the latter the impregnated portion of the wood should retain not less than 5 lb. of preservative per cub. ft. Treatment with zinc chloride is suggested for woods resistant to creosote, and, in dry climates, for track sleepers, etc., having a life of not more than 11 years. This preservative should only be used in cases where the treated timber is to be subject to mechanical wear or to be in contact with water; when employed it should be applied by the standard method known as "Burnettizing," the timber being sufficiently impregnated to ensure the retention of at least ½ lb. (preferably ¾ lb.) of the dry salt per cub. ft. In the absence of data showing the value of the combination as compared with the single preservatives, no recommendations are made regarding the use of zinc chloride and creosote in admixture (Card, Allardyce, and Rutger processes). As regards the use of coal tar-creosote mixture, it is stated that refined coal tar (under the restrictions specified by the American Railway Engineers' Assoc.) does not reduce the efficiency of creosote and, in quantities up to 30%, should not be considered an adulterant of the latter.—W. E. F. P.

Coal tar creosote, creosote distillates and individual constituents; Comparative toxicity of —— for the marine wood borer, Xylotrya. L. F. Shackell. Amer. Wood-preservers' Assoc., Chicago, Jan., 1915. [Advance proof.] 9 pages.

The toxicity of creosote fractions diminishes with rise of b. pt., the light oils being very toxic even in the extremely small proportions in which they dissolve in sea water. Naphthalene and anthracene are practically non-toxic, but the tar acids are extremely toxic; α-naphthol is many times more poisonous than phenol. The toxicity of creosote and its fractions is reduced by the loss of volatile constituents at ordinary summer temperature.—W. E. F. P.

Wood under treatment; Temperature changes in ——. G. M. Hunt. Amer. Wood-preservers' Assoc., Chicago Jan. 1915. [Advance proof.] 15 pages.

Sleepers of maple, red oak, loblolly pine, and hemlock, each 8½ ft. long and 6 by 8 in. in cross section, were treated with saturated steam at atmospheric pressure (212° F., 100° C.), and at 20 lb. per sq. in. (259° F., 126° C.), and with creosote at 212° F. (100° C.) and 185° F. (85° C.). The heating was continued until the rise in temperature within the sleeper was not more than 1·8° F. (1° C.) in 10 mins., and in most cases considerably beyond this point; at the close of the

heating period a vacuum of 26 in. was applied for 1 hour. The results obtained are shown in a series of time-temperature curves. The interior temperature of the sleepers did not rise appreciably during the first 30 or 40 mins., and in no case quite attained that of the heating medium, the rate of increase being greatest with steam at 20 lb. pressure, least with creosote at 185° F. (85° C.), slightly greater with steam at 212° F. (100° C.) than with creosote at the same temperature, and apparently independent of the kind of wood. With steam at 20 lb. pressure, the time required for the interior of the sleepers to reach 212° F. (100° C.) varied from 2¾ to 5 hrs., average 4½ hrs.; the interior temperature fell very rapidly upon the application of the vacuum. Seasoned sleepers heated more rapidly than green ones, the latter being badly "checked," and the former not seriously affected, by treatment with steam at 20 lb. pressure.—W. E. F. P.

Paving blocks; The bleeding and swelling of [wood] ——. C. H. Teesdale. Amer. Wood-preservers' Assoc., Chicago, Jan. 1915. [Advance proof. 26 pages.

Before treatment with preservative, all blocks, air-seasoned or not, should be well steamed so that absorption may be less rapid and more uniform, that a greater pressure may be applied for a longer period, and that seasoned blocks may expand by absorbing moisture and thus become less liable to swell after laying. For the latter reason green is preferable to seasoned material, and treated blocks should not be allowed to become dry before laying. A vacuum treatment is desirable after the steaming period and also after removal of the oil from the impregnating cylinder; if tar mixtures be used, the final vacuum should be followed by steaming to remove carbon and dirt from the surface of the blocks. Swelling is not appreciably decreased by increasing the absorption of oil above 10 lb. per cub. ft., and is only slightly retarded by the use of tar mixtures; bleeding tends to increase when the amount of oil absorbed is more than 16 lb. per cub. ft. In framing specifications for treating blocks, much less consideration should be given to the water-proofing effect of the oil or treatment than to the use of sufficient oil of good grade to penetrate the wood thoroughly by methods that will not cause the blocks to bleed; swelling can be prevented by treating the blocks in the green condition and so laying them that water will not penetrate to the bottom.—W. E. F. P.

Patents.

Tiles, roof sheets, and the like; Manufacture of ——. E. R. Sutcliffe, Leigh, Lancs. Eng. Pat. 22,423, Oct. 4, 1913.

Slabs or sheets made from sand and lime, with which asbestos fibre is incorporated, are subjected to mechanical pressure during the process of induration by treatment with steam.—W. C. H.

Cement [from felspar]; Process of making hydraulic ——. H. E. Brown, Kingston, N.Y., Assignor to W. R. Warren, New York. U.S. Pat. 1,124,238, Jan. 5, 1915. Date of appl., Nov. 16, 1914.

Felspar is fused, under non-reducing conditions, with sufficient calcium chloride to furnish enough chlorine to combine with the potassium, and sufficient calcium carbonate to raise the lime content of the product to 40%—55%. The volatilised potassium salt is collected, and the molten reaction product is treated with one or more salts capable of forming Sorel cement or salts of alkali-forming metals in solution, capable of increasing the hydraulic properties of the product, to produce hydraulic cement in which the lime content is between 40% and 55%.—W. C. H.

Alkalis from flue gases [of cement kilns]; Process of recovering ——. S. B. Newberry, Baybridge, Ohio, Assignor to J. R. Morron, New York. U.S. Pat. 1,121,532, Dec. 15, 1914. Date of appl., Oct. 5, 1911.

Flue dust is leached with water and the resulting solution passed over an extended surface, in contact with a counter-current of flue gases, so as to concentrate the solution to the crystallisation point by absorption of salts from the gases and by evaporation. The deposited salts are separated from the cooled solution and the mother liquor is again brought in contact with the gases.—F. Sodn.

Cement; Slow or semi-slow setting hydraulic ——. A. C. Vournasos. Fr. Pat. 470,962, April 10, 1914.

"Santorin earth" is mixed with fat lime to form a slow-setting cement, or with lime and a quick-setting cement to form a semi-slow-setting cement.—W. C. H.

Hydraulic cementing material or cement or plaster; Manufacture of ——. W. A. Oakley, Bondi, N.S.W. Eng. Pat. 16,243, July 15, 1913.

Material for cementing sand and the like is prepared by adding hydrochloric acid to magnesium or calcium carbonate or oxide, with which kaolin or clay is mixed, the mass being dried and ground, and mixed with from 1 to 3 parts of magnesium oxide.—W. C. H.

Impregnating wood, etc.; Apparatus for ——. F. Moll, Berlin-Südende, Germany. U.S. Pat. 1,122,407, Dec. 29, 1914. Date of appl., July 23, 1913.

See Fr. Pat. 463,630 of 1913; this J., 1914, 356.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Slag inclusions in molten steel; The alleged solubility of ——. F. Giolitti and G. Tavanti. Annali Chim. Appl., 1914, 2, 360—366.

Specimens of an acid steel and a basic steel were examined after being suddenly cooled from the fused condition, after annealing, and after slow cooling, respectively. In both cases the appearance, number, and size of the slag inclusions were not appreciably modified by the different treatments, and this result excludes the possibility of the slag being dissolved by the molten steel as affirmed by Ziegler (this J., 1911, 1214). Steinberg (Rev. Mét., May, 1914, Abstracts, 313), in experiments with artificial inclusions of sulphides of iron and manganese, found that inclusions in specimens of steel quenched from the liquid state were many times smaller than in similar specimens annealed after such quenching. This result, entirely at variance with the results obtained by the author in the case of "reaction slags," indicates that the latter are not, as commonly supposed, composed mainly or entirely of manganese sulphide.—A. S.

Tungsten; Analytical examination of [commercial] ——. *II.* H. Arnold. Z. anorg. Chem., 1914, **88**, 333—340. (See this J., 1914, 924.)

Silicon is determined by converting the tungsten into tungstic acid and evaporating with hydrofluoric acid, using a deep crucible which is covered

whilst expelling the last trace of acid; or, the tungstic acid is fused with 6—8 times its weight of potassium bisulphate, the cooled mass treated with water, tungstic acid dissolved in ammonium carbonate, and the residual silicic acid ignited and evaporated with hydrofluoric acid; or, an alkaline solution of 5 grms. of the tungstic acid is mixed with 7 c.c. of tartaric acid, the mixture acidified with formic or oxalic acid, the solution evaporated to dryness in a platinum dish, and the residue dried at 120° C. for some hours, treated with hot water, and digested on the water-bath, the silica being filtered off, ignited, weighed, and evaporated with hydrofluoric acid. *Phosphorus and arsenic.*—Phosphoric acid is precipitated from the tungstic acid solution with molybdic acid by Finkener's method, in the presence of tartaric acid, the precipitate is dissolved in 2·5% ammonia (see Hinrichsen; this J., 1910, 955), and the boiling solution precipitated by magnesia mixture containing about 5% $MgCl_2$ and 15% NH_4Cl (Jörgensen; Z. anal. Chem., 1906, **45**, 273); or, the solution is precipitated first with magnesia mixture, the precipitate dissolved in nitric acid, tartaric acid added, and the solution precipitated by Finkener's method. To determine arsenic when phosphorus is present, about 10 grms. of the tungstic acid is dissolved in 100 c.c. of 20% caustic soda, the solution boiled for half-an-hour, precipitated with boiling magnesia mixture as above, allowed to stand for at least 12 hours, and arsenic separated as the trichloride by distilling with hydrochloric acid and cuprous chloride, the distillation being repeated after treating with alkali (Hilpert and Dieckmann; this J., 1913, 215), unless the proportion of tungsten in the precipitate is small. The arsenic may be weighed as silver arsenate, precipitated in acetic acid solution (Schürmann and Böttcher; Chem.-Zeit., 1913, **37**, 49). Phosphorus, in presence of arsenic, is determined by heating the magnesium precipitate (which may be filtered off soon after settling) on the water-bath with bromine-hydrochloric acid, to volatilise the arsenic, and then precipitating by Finkener's method from nitric acid solution. *Sulphur* is determined by precipitating the concentrated tungstate solution with barium chloride in the presence of tartaric acid, adding a few drops of oxalic acid solution or ammonia, if the proportion of sulphur be small, so as to carry down the sulphate with the precipitated barium oxalate or tungstate. After ignition, the precipitate is treated with dilute hydrochloric acid and then with ammonia or caustic soda to extract the co-precipitated tungstate. Finely divided metallic tungsten is best treated by the method of Müller and Diethelm (this J., 1910, 1386), the oxides of sulphur being preferably absorbed by caustic soda and bromine. *Carbon.*—With finely divided metal, the method of Müller and Diethelm (*loc. cit.*) is adopted; but compact pieces are dissolved electrolytically in ammonia (this J., 1914, 924), without an oxidising agent, the current being so regulated that no gas is evolved at the anode; after filtering through asbestos, the carbon is determined by moist combustion with chromic acid.—F. SODN.

Cerium and cerium alloys; Determination of carbon and phosphorus in ——. H. Arnold. Z. anal. Chem., 1914, **53**, 678—682. Chem.-Zeit., 1914, **38**, Rep., 576.

TOTAL carbon is determined by means of chromic and sulphuric acids according to the method of Corleis, the reaction being moderated by preliminary treatment of the metal with copper sulphate solution. Free carbon is determined by treating the metal with cupric chloride solution, and then adding ferric chloride and hydrochloric acid and warming on the water-bath until the carbide is completely decomposed. The residue is collected on an asbestos filter and the carbon determined with chromic and sulphuric acids. Phosphorus is determined by precipitating the oxalates of the rare-earth metals from the neutralised nitric acid solution of the metal, evaporating the filtrate, decomposing the oxalic acid therein by means of concentrated nitric acid, and applying the molybdate method.—J. R.

Cobalt; Physical properties of the metal ——. H. T. Kalmus and C. Harper. J. Ind. Eng. Chem., 1915, **7**, 6—17.

THE cobalt examined was reduced from the oxide by the method described previously (this J., 1914, 261). The pure metal (Co 99·1—99·9%) resembles nickel in appearance but when electro-deposited and polished it has a slightly bluish cast. The specific gravity, referred to water at 4° C., is 8·7918 at 17° C. for the unannealed metal, 8·8105 at 14·5° C. after annealing, and 8·9253 at 16·5° C. after swaging. The Brinell hardness, determined in a standard Olsen machine, with a load of 3500 lb., was about 124 for cobalt cast in an iron mould, that of nickel cast under similar conditions being about 83 and of cast iron about 102. The presence of 0·06—0·37% C had less effect on the hardness of cobalt than slight variations in heat treatment. If the melting point of nickel be taken as 1452° C. (Burgess and Waltenberg, this J., 1913, 830) pure cobalt melts at 1478° ± 1·1° C. It has a tensile strength of about 34,400 lb. and a compressive strength of about 122,000 lb. per sq. in. as cast, the corresponding figures after annealing being 36,980 lb. and 117,200 lb. per sq. in. respectively. Cast cobalt containing 0·06—0·3% C has a tensile strength of about 61,000 lb. and a compressive strength above 175,000 lb. per sq. in. Both the tensile and compressive strengths are greater than those of pure iron or nickel cast and tested under similar conditions. The reduction of area and elongation are low for pure cobalt, but rise to above 20% in the case of "commercial" cobalt (96·5—99·6% Co) containing carbon and other impurities. Pure cast cobalt can be machined in a lathe and, if the casting be cooled under high pressure, can subsequently be rolled or swaged at 500°—600° C. Commercial cobalt is easily machined and can be rolled or swaged at red heat without any special preliminary treatment. The specific electrical resistance of cobalt wire of high purity is $89·64 \times 10^{-7}$ ohms per cm. cube, and is largely influenced by the presence of occluded gas, being increased by annealing in an inert gas at low temperatures and diminished by annealing *in vacuo*. The electrical resistance of commercial cobalt is 231×10^{-7} to 103×10^{-7} ohms per cm. cube, and is greatly reduced by annealing *in vacuo*. The specific heat of pure cobalt between 0° and 890° C. is given by the formula: $0·1058 + 0·0000457t + 0·00000006t^2$. The paper is accompanied by 11 photomicrographs.—A. S.

German iron and steel production in 1914. Engineering, Feb. 12, 1915.

THE Union of German Iron and Steel Industries states that the production of pig-iron within the German Customs Union for December, 1914, amounted to 853,881 tons, against 1,611,250 tons for December, 1913, whilst there was an improvement as compared with November, 1914, for which the figure was 788,956 tons. The production of pig-iron per day, since the war began, averaged:—August, 18,925 tons; September, 19,336; October, 23,543; November, 26,299; December, 27,545 tons. The production for December comprised:—Foundry pig, 148,881 tons; Bessemer pig, 8778;

Thomas pig, 542,808 ; steel, etc., 128,317 ; puddle, 25,097 tons. The aggregate production of the different brands for the last two years was :—

	1914.	1913.
	Tons.	Tons.
Foundry pig	2,494,527	3,657,326
Bessemer pig	237,988	368,840
Thomas pig	9,289,989	12,193,336
Steel, etc.	1,996,786	2,599,887
Puddle	370,257	489,783
	14,389,547	19,309,172

The reduction in the production was most marked in Lorraine, Luxemburg, Rhineland, and Westphalia, whilst less pronounced in Silesia.

Reduction of ferric sulphate in acid solution by means of cadmium amalgam for titration of iron and free sulphuric acid. Capps and Boics. *See* VII.

PATENTS.

Magnetic material [iron and steel] ; Enhancing the permeability of ——. E. Wilson, London. Eng. Pats. 194, Jan. 3 ; 2197, Jan. 27 ; 5012, Feb. 26 ; and 5844, March 7, 1914.

THE magnetic properties of iron and steel are improved by protecting the articles from the earth's field whilst they are demagnetised by means of a gradually diminishing alternating magnetising force ; cooled from the temperature at which they are non-magnetic ; warmed from the temperature of liquid air ; or, when it is desired to increase the permeability for large values of flux, subjected to a strong magnetising force. The necessary protection is given by a casing of iron, or by a cage of current-carrying conductors adapted exactly to neutralise the earth's field. As an example of the adaptation of the principle, a wireless telegraph detector is described in which the active part of the core is shielded as mentioned above, and is demagnetised as it enters the shielding box.—T. ST.

Magnetic body [alloy of iron, silicon, aluminium, and manganese] ; Process for improving the magnetic qualities of a ——. R. A. Hadfield, Sheffield, England. U.S. Pat. 1,122,385, Dec. 29, 1914. Date of appl., March 21, 1907 ; renewed May 26, 1914.

AN iron-silicon-aluminium-manganese alloy is heated to a relatively high temperature, below its melting point (*e.g.*, to 900°—1000° C.), and cooled rapidly, so that the changes effected by heating are retained substantially unaltered. The alloy is then reheated to substantially the same temperature as before and cooled slowly.—T. ST.

Iron or steel ; Production of stains or colours on —— for sclerometric purposes. Rudge-Whitworth, Ltd., and H. L. Heathcote, Coventry. Eng. Pat. 910, Jan. 13, 1914.

ARTICLES of hardened steel or iron are placed collectively, after cleaning, in an etching solution for from 10 to 60 seconds, then washed by immersion in hot water, and dried in sawdust or the like. By examining the stains thus produced on the brightened surfaces, any imperfectly hardened articles can be detected. The etching solution is preferably composed of substantially 10 vols. each of industrial methylated spirit and water and 1 vol. of commercial nitric acid of sp. gr. 1·30, but other acids (picric, chromic, sulphuric, sulphurous, or acetic acid) may also be used. The solution is non-inflammable at normal temperatures. To indicate small differences of hardness it is necessary to restrain the action of the etching fluid ; this is conveniently done by adding to the solution as described about 5% of a 1% solution of iodine in industrial methylated spirit.—T. ST.

Steel ; Alloyed ——. J. Churchward, Mount Vernon, N.Y., Assignor to Churchward International Steel Co., New York. U.S. Pat. 1,122,861, Dec. 29, 1914. Date of appl., March 18, 1911.

AN alloy composed of steel (with C 0·10 to 1·00%) 92·4, Ni 3·50, Cr 2·00, W 1·00, Mn 0·50, Si 0·25, V 0·35 to 0·75%.—T. ST.

Manganese steel ; Heat treatment of ——. W. S. Potter, Pittsburgh, Pa. U.S. Pat. 1,123,003, Dec. 29, 1914. Date of appl., April 17, 1914.

THE steel is heated to a maximum temperature (slightly above 825°—850° C.) not more than 125° C. above the upper limit of the critical range for the re-solution of the constituents which have separated from the mixed crystals. The maximum temperature is maintained until equilibrium is established, and the steel is then rapidly cooled.—T. ST.

Steel articles ; Manufacture of ——. H. M. Howe, Bedford Station, N.Y., Assignor to Taylor-Wharton Iron and Steel Co., High Bridge, N.J. U.S. Pat. 1,123,193, Dec. 29, 1914. Date of appl., July 17, 1909 ; renewed July 9, 1914.

ARTICLES composed of an alloy of manganese, iron, and carbon, and designed to resist wear and shock, are treated to produce an austenitic condition in the interior, and a martensitic condition for a depth of about 1/16 inch on the wearing surface.—T. ST.

Converter process. [Manufacture of steel.] O. Thiel. Ger. Pat. 277,764, March 1, 1914.

THE charge in the converter is increased during a blow, so that the bath of iron and slag is maintained at a given height and the pressure conditions kept constant. In this way the output of the converter can be increased, on the average, by more than 30%.—A. S.

Scrap iron ; Treatment of tinned and galvanised ——, scrap zinc, and old tinned and galvanised utensils. W. A. Hills, London. Eng. Pat. 933, Jan. 13, 1914.

TINNED and galvanised scrap iron, etc., is melted in an electric or other suitable furnace in which the requisite high temperature, and a neutral or reducing atmosphere, can be obtained. The non-ferrous metals are volatilised and are either recovered in the metallic form in suitable condensers, or are oxidised and the oxides recovered. The form of condenser preferred is one in which the vapours are mixed with a spray of water or other suitable liquid, created by the rapid revolution of a vertical wheel in a closed vessel. Salts of the metals may be produced by the use of acid and alkali solutions. After the volatile metals have been removed, fluxes are added to the molten bath to produce marketable forms of iron or steel.
—T. ST.

Alluvial ores and alluvial gold ; Apparatus for concentrating ——. J. F. Lobb, Wood Green, and A. B. L. Williams, Highbury. Eng. Pat. 21,858, Sept. 27, 1913.

AN inclined sluice, pivoted at its upper end and mounted on springs, is given a rapid vertical reciprocating motion by a tappet wheel acting on

a roller placed on the under side near the lower end. Ore and alluvium are washed down the sluice with water, the ore being retained at weirs and in classifiers from which it is discharged without stopping the action. In line with the sluice is a fixed inclined launder provided with a settling well and a ridge for the removal of tailings. At the outlet of the launder and operated by the effluent is a water-wheel which, through suitable gearing, actuates the tappet wheel. When the ore contains gold, mercury baths are provided behind the weirs and suitable riffles.—T. ST.

Copper; Apparatus for use in discharging —— from refining furnaces. E. John, Landore, Glam. Eng. Pat. 28,575, Dec. 11, 1913.

MOLTEN copper is run from the refining furnace into a forehearth composed of a metal casing lined with firebrick, and thence into moulds below through openings in the bottom of the forehearth controlled by stoppers actuated by levers placed in front. (Reference is directed, in pursuance of Sect. 7, Sub-section 4, of the Patents and Designs Act, 1907, to Eng. Pat. 8314 of 1904).—T. ST.

Sulphides; Separation of metallic ——. L. Bradford, Broken Hill, N.S.W. Eng. Pat. 19,844 of 1914; date of appl., Sept. 18, 1913. Under Int. Conv., July 19, 1913.

IN the separation by flotation of mixed sulphides, such as blende and galena, a solution of an alkali sulphite or thiosulphate, or sulphurous acid is added to the "wetting medium" to retard the flotation. The tendency of the sulphides which rise to the surface to carry up the other sulphides is thus reduced.—T. ST.

Sulphide ores; Separation of mixed ——. Minerals Separation and De Bavay's Processes Australia Proprietary, Ltd., Melbourne, Australia. Eng. Pat. 22,145, Nov. 6, 1914. Under Int. Conv., Nov. 13, 1913.

MIXED sulphides are subjected to a flotation separation with agitation and aeration in water to which an alkali permanganate, but no frothing agent, has been added. When mixtures of galena and blende are so treated, a float concentrate relatively rich in galena is obtained. —T. ST.

Zinc furnace with integral condenser; Electric ——. C. V. and M. Thierry, Paris. U.S. Pats. (A) 1,122,663 and (B) 1,122,664, Dec. 29, 1914. Date of appl., May 21, 1913.

(A) THE furnace is heated by a carbon resistor supported directly above a sump, with its side surfaces partially retained by spaced plates. The ore charge is introduced through vertical tubes into a series of enclosed pockets disposed transversely to the sides of the resistor, and the volatilised products are passed into the resistor, and thence upwards through a series of superimposed filter-chambers filled with carbon, which are wider than and partially supported by the resistor. Liquid zinc is collected in reservoirs on either side, above the plane of the resistor, whilst uncondensed fumes and gas are passed upwards and out into the atmosphere. (B) The carbon resistor is arranged longitudinally in the furnace, and the reaction takes place along one of its vertical sides, the opposite side being connected with a parallel filter-chamber by a number of interposed condenser tubes filled with carbon, so that the volatilised products are passed directly from the resistor into the tubes. The furnace is provided with an open space above the tubes, so that the rate of radiation of heat may be regulated.—B. N.

[Metallic] catalysts; Method of making —— [from formates]. W. O. Snelling, Pittsburgh, Pa. U.S. Pat. 1,122,811, Dec. 29, 1914. Date of appl., July 19, 1913.

A POROUS carrier is impregnated with a solution of a metallic formate, *e.g.*, copper formate, and is then heated in an atmosphere of hydrogen to the lowest temperature at which the formate is reduced.—T. ST.

Metals; Electrolytic deposition of —— from solutions. N. V. Hybinette, Christiania, Norway. U.S. Pat. 1,123,299, Jan. 5, 1915. Date of appl., May 22, 1913.

THE electrolyte, which contains considerable quantities of ferric salts in addition to the metal to be recovered, is circulated through the anode chamber, but circulation from the anode to the cathode chamber is prevented by a permeable partition. The metal to be recovered, having a greater rate of diffusion than the ferric salt, passes into the cathode chamber and is deposited on the cathode.—B. N.

Tin; Electrolytic refining of —— applicable to any conducting material containing tin. G. Michaud and E. Delasson. Third Addition, dated March 26, 1914, to Fr. Pat. 435,936, Nov. 4, 1911 (this J., 1912, 395, and 1913, 240).

THE anodes, consisting of movable baskets of conducting material carrying the tin-plate scrap, are immersed in the electrolyte between two cathodes, formed of perforated plates of copper. Each plate is supported between two movable scrapers, which cause the tin to fall to the bottom of the vat, where it is gathered up by scrapers mounted on an endless chain and removed from the bath.—B. N.

Electrolytic cell. H. Dittner. Fr. Pat. 471,078, April 17, 1914.

THE cell may be employed for the electro-deposition of all metals, but more particularly for the electrolytic recovery of tin from tin-plate scrap. A continuous circulation is maintained from the lower part of each cathode to the upper portion of the corresponding anode, in the opposite direction to the migration of the cathode ions. The circulation is maintained by means of a pump, or a thermo-siphon heated by suitable burners, according to whether a cold or hot bath is used. The cathodes are burnished continuously by means of glass balls or tubes, of slightly higher density than the electrolyte, these being disposed around the cathode and given an ascending and descending movement by means of a current of gas at a convenient pressure in the cathode chamber, or by the electrolytic gas. A cathode with sloping surfaces may be used, against which are disposed glass rubbing tubes. When copper is used for the cathode, it is first treated with iodine vapour, whereby whilst the electrical conductivity of the plate is maintained, the adherence of metallic deposits is prevented.—B. N.

Metals; Precipitating —— from solutions. L. D. Mills, Johannesburg, South Africa, Assignor to Merrill Metallurgical Co. U.S. Pat. 1,123,778, Jan. 5, 1915. Date of appl., May 14, 1913.

A HOMOGENEOUS mixture of the metal-bearing solution and a mobile precipitant is maintained at the surface of a filter medium through which the solution is drawn, whereby the solid matter is deposited as a homogeneous and uniformly permeable layer. The heavier settled particles of the precipitant and precipitate are collected, and the mixture containing these heavier particles is circulated near to the filter medium.—T. ST.

Ores; Nodulising ——. N. S. Borch, Copenhagen, Denmark. U.S. Pat. 1,123,672, Jan. 5, 1915. Date of appl., May 7, 1913.

THE ore, mixed with carbonaceous material, is passed through a rotary kiln, in the first part of which the charge is heated in a reducing atmosphere nearly to the sintering temperature. The mass is then subjected to an oxidising action, whereby the temperature is raised suddenly through the degree required for nodulisation without a corresponding rise in the temperature of the wall of the kiln.—T. ST.

Roasting furnaces; Rabbles for mechanical ——. O. Spinzig and W. Hommel. First Addition, dated April 7, 1914, to Fr. Pat. 460,127, July 3, 1913. Under Int. Conv., April 9, 1913.

THE rabble is provided with two rows of blades or scrapers so arranged that, during operation, those in one row move the material into the zone traversed by the next row. The material is thus moved progressively across the hearth and prevented from accumulating at the sides.

—W. E. F. P.

Calamine and other carbonate ores; Process and furnace for calcining finely divided ——. A. Mercier-Pageyral. Fr. Pat. 470,204, June 9, 1913.

A MIXTURE of the ore with sufficient coal to effect complete calcination is treated in a bucket-shaped furnace, mounted on trunnions, and having a perforated false bottom or grate below which is an air-pressure chamber. A small quantity of ignited fuel is placed on the grate, charging commenced, and the blast started, the latter being gradually increased until, when charging is finished, a pressure of about 12 cm. of water is attained.

—W. E. F. P.

[Bearing metal] alloy. E. Flügel. Fr. Pat. 470,693, April 8, 1914.

AN alloy (bearing metal), prepared from brass or bronze of known composition, and containing Zn 34, Al 5, Sn 5, and Pb 3%, the permissible variation being 10% for each constituent.

—W. E. F. P.

Tungsten and its alloys; Manufacture of wires of ——. K. R. R. Siefert. Fr. Pat. 471,116, April 18, 1914. Under Int. Conv., April 21 and July 30, 1913.

SEE U.S. Pat. 1,103,382 of 1914 (this J., 1914, 870). The bar of compressed metallic powder is heated to the sintering temperature (minimum, 900° C.) by means of two electrodes situated at opposite sides of the die and forming the holders or clamps between which the metal is stretched.—W. E. F. P.

Metals; Process for obtaining oxidisable ——. A. Zavelberg. Ger. Pat. 277,679, Aug. 5, 1913. Addition to Ger. Pat. 226,257.

THE process described in the chief patent (this J., 1910, 1460) is divided into two stages, about 55% of the metal being recovered in the first stage and the hot charge then transferred to a second chamber or shaft in which the reaction is completed. By working in this manner, wider shafts and larger charges can be used.—A. S.

Steel; Manufacture of ——. W. R. Walker, New York. Re-issue No. 13,861, Jan. 5, 1915, of U.S. Pat. 1,014,425. Date of appl., Oct. 9, 1914. SEE this J., 1912, 192.

Ingot-iron and the like; Process for improving the properties of ——. H. Goldschmidt and H. Biewend, Essen on the Ruhr, Germany, Assignors to Goldschmidt Thermit Co., New York. U.S. Pat. 1,122,272, Dec. 29, 1914. Date of appl., May 31, 1912.

SEE Fr. Pat. 443,652 of 1912; this J., 1912, 993.

Ferro-chromium; Process of manufacturing ——. H. Goldschmidt and O. Weil, Essen-on-the-Ruhr, Germany. Assignors to Goldschmidt Thermit Co., New York. U.S. Pat. 1,122,907, Dec. 29, 1914. Date of appl., May 22, 1913.

SEE Addition of April 26, 1913, to Fr. Pat. 453,205 of 1913; this J., 1913, 1072.

Sulphides; Separation of metallic ——. L. Bradford, Broken Hill, N.S.W. Eng. Pat. 21,104, Sept. 18, 1913. Under Int. Conv., Sept. 19, 1912.

SEE Fr. Pat. 462,580 of 1913; this J., 1914, 319.

Metals, such as copper or iron, or coal, or fabrics made of organic materials; Treatment of ——. J. A. McLarty, Toronto, Canada. Eng. Pat. 25,013, Nov. 3, 1913. Under Int. Conv., Nov. 20, 1912.

SEE U.S. Pat. 1,079,787 of 1913; this J., 1914, 31. The process may also be applied to coal and to fabrics.

Zinc from zinc-coated material; Process of removing ——. J. Weber, Essen on the Ruhr, Germany, Assignor to Goldschmidt Detinning Co., New York. U.S. Pat. 1,122,340, Dec. 29, 1914. Date of appl., June 25, 1910.

SEE Fr. Pat. 415,856 of 1910; this J., 1910, 1316.

Copper from ores; Process of extracting ——. N. V. Hybinette, Christiania, Norway. U.S. Pat. 1,122,759, Dec. 29, 1914. Date of appl., May 22, 1913.

SEE Eng. Pat. 22,745 of 1913; this J., 1914, 359.

Iron and nickel; Separation of —— from copper in the treatment of cupriferous sulphide ores and metallurgical products (mattes). V. von Hartogensis. Fr. Pat. 470,404, April 1, 1914. Under Int. Conv., July 31, 1913.

SEE Ger. Pat. 271,595 of 1913; this J., 1914, 488.

Tin or tin compounds; Production of —— from pyritic or other tin ores, tin-ore concentrates, tin waste, tin-plate waste, stanniferous slag, tin-slag and the like. J. Rueb, The Hague. U.S. Pat. 1,124,174, Jan. 5, 1915. Date of appl., Jan. 2, 1913.

SEE Eng. Pat. 27,148 of 1912; this J., 1913, 795.

Tungsten; Treatment of —— [to render it ductile]. C. Gladitz. Fr. Pat. 470,651, April 8, 1914.

SEE Eng. Pat. 12,421 of 1913; this J., 1914, 793.

Alloy of nickel and copper; Hard ——. P. J. A. Douglass. Fr. Pat. 470,659, April 8, 1914. Under Int. Conv., April 9, 1913.

SEE Eng. Pat. 8331 of 1913; this J., 1914, 87.

Process for agglomerating and sintering materials of all kinds by flameless surface combustion. Ger. Pat. 277,854. *See* I.

XI.—ELECTRO-CHEMISTRY.

Hermann's phenomenon. [*Production of free acid or alkali on passing an electric current between solutions of a neutral salt of different concentrations.*] G. S. Walpole. Roy. Soc. Proc., 1915, A 91, 134—147.

HERMANN (Göttinger Nachrichten, 1887) noticed that when an electric current passed from a dilute to a more concentrated aqueous solution of the same neutral salt, acid was liberated at the boundary layer between the two fluids, and that when the current was reversed, alkali was liberated at the same place. In general, alkali is liberated if a

current passes from a better to a worse conducting solution, and acid is liberated if a current passes in the opposite direction. The amounts may be calculated from the potential gradients in the solutions on each side of the boundary, the time for which the difference of potential is maintained, the resistance constant of the vessel employed, the dissociation constant of water, and the known migration velocities of hydrogen and hydroxyl ions.—O. R.

Electrical conductivity of certain electrolytes in organic solvents. Pearce. *See* VII.

Electrolytic separation of zinc, copper, and iron from arsenic. Balls and McDonnell. *See* XXIII.

PATENTS.

Insulating material. F. Bölling, Oberursel, Assignor to "Prometheus" Fabrik Elektrischer Koch- und Heizapparate Ges. m. b. H., Frankfort on Maine, Germany. U.S. Pat. 1,123,985, Jan. 5, 1915. Date of appl., May 31, 1913.

SEE Eng. Pat. 21,445 of 1912; this J., 1913, 290.

[*Electrical*] *production of compounds of nitrogen.* Fr. Pat. 470,916. *See* VII.

Enhancing the permeability of magnetic material [*iron and steel*]. Eng. Pats. 194, 2197, 5012, and 5844 of 1914. *See* X.

XII.—FATS; OILS; WAXES.

Sesamé oil in olive oil; Pharmacopœia test for ——. C. E. Sage. Pharm. J., 1915, **94**, 128.

CERTAIN pure Tunisian and Spanish olive oils give a coloration in the Baudouin test indicating the presence of 1 to 5% of sesamé oil, and would therefore be condemned by the new B.P. Villavecchia and Fabri's modification of the test (shaking the oil with HCl and one drop of 1% furfural solution) will distinguish between such genuine olive oils (pink layer changing to lilac in an hour) and those adulterated with sesamé oil (pink colour persisting for an hour).—C. A. M.

Fats; Action of hydrazine hydrate on ——. P. Falciola and A. Mannino. Annali Chim. Appl., 1914, **2**, 351—356.

BY the action of hydrazine hydrate on olive oil, a nitrogenous substance was produced, which was separated by extraction with alcohol, and after two crystallisations from this solvent melted at 110°—112° C. and solidified at 105° C. The solubility in 95% alcohol was 0·5% at 30° C. and 1·6% at 50° C. The substance was nearly insoluble in ether and in cold petroleum spirit, carbon bisulphide, and chloroform; slightly soluble in hot chloroform, and soluble in hot benzene and acetic acid. It was more soluble in acetone than in alcohol, but the white crystals which separated from the solution melted at 65°—67° C. Similar white or light-coloured products of high melting point were obtained from tung, linseed, cod-liver, arachis, walnut, chrysalis, castor, bone, and henbane seed oils and from tallow. They may be used alone or mixed with naphthalene or anthracene for the manufacture of candles. By the action of excess of 90% hydrazine hydrate on triolein, a white substance was obtained of m. pt. 110°—112° C., containing C 74·32—74·47, H 13·56—13·64, and N 9·03—9·07%. When recrystallised from acetone it gave a substance of m. pt. about 76° C., but this when again recrystallised from alcohol gave a product melting at 106°—108° C. Tristearin and hydrazine hydrate gave a substance, m. pt. 112° C., containing C 73·1, H 13·4, and N 9·1%, and tripalmitin gave a substance melting at 108°—109° C. —A. S.

Kapok oil; Detection of ——. A. A. Besson. Chem.-Zeit., 1914, **38**, 982.

THE red coloration produced by kapok oil with Halphen's reagent is about twenty times more intense than that given by cottonseed oil; the presence of 0·05% of kapok oil in other oils may be detected by this test. Kapok oil may be differentiated from cottonseed oil by shaking a solution of the oil in chloroform with a 2% solution of silver nitrate in absolute alcohol; kapok oil almost immediately gives a coffee-brown coloration whilst cottonseed oil yields a yellow coloration only after a few hours: 1% of kapok oil may be detected in cottonseed oil, and 0·25% in olive, sesamé, and earthnut (arachis) oils by this test. The fatty acids of kapok oil readily yield anhydrides (lactones) when boiled with water (see this J., 1902, 1336; 1903, 306); whilst the saponification value of the oil may be found to be 196, the fatty acids may show an acid value of only 135. —W. P. S.

Fatty acids; Influence of hydroxy-acids and lactones upon determinations of the chemical constants of ——. C. A. Browne. J. Ind. Eng. Chem., 1915, **7**, 30—34.

THE effect of lactone-forming hydroxy-acids (especially γ-hydroxy-acids) on the determination of the chemical characters of fatty acids is discussed. When the mixed fatty acids contain lactones, as shown by a difference between the neutralisation and saponification values (Tortelli and Pergami, this J., 1902, 1187; Lewkowitsch, "Oils, Fats, and Waxes," 4th Ed., Vol. 1, 419—421), the mean molecular weight (m) of the original lactone-free acids is given by the formula: $m=\frac{56108+18\cdot016\,(s-a)}{s}$, where a is the neutralisation value and s the saponification value of the mixed acids. In regard to the acetyl value, the view is expressed that since lactones are formed from pre-existing hydroxy-acids, the acetyl value of Benedikt and Ulzer, *i.e.*, the ester value of the acetylated acids, is a truer measure of the original hydroxyl content of fatty acids than the acetyl value of Lewkowitsch, *i.e.*, the mgrms. of potassium hydroxide necessary to saponify the combined acetyl in the acetylated acids. γ-Hydroxystearic acid, for example, can be acetylated when combined as a glyceride, but the separated acid would show no acetyl value on account of the formation of stearolactone. The true original acetyl value, referred to the acetylated hydroxy-acids before lactone formation, may be calculated from the acetyl value determined on a mixture of fatty acids containing lactones by the formula: $\frac{\epsilon}{1+0\cdot00107(\epsilon-\xi)}$, where ϵ is the observed acetyl ester value (Benedikt-Ulzer) and ξ the acetyl value (Lewkowitsch). The formation of small quantities of acid anhydrides or lactones and the slight acetylation of pre-existing lactones are mentioned as possible causes of irregularities in the normal process of acetylation, and a combination of the Benedikt-Ulzer and Lewkowitsch methods of determining the acetyl value is recommended as throwing most light on the chemical changes which take place in insoluble fatty acids as a result of oxidation.—A. S.

Spermaceti; Solidifying and melting points of ——. R. Meldrum. Chem. News, 1915, **111**, 37—39.

BY Dalican's method spermaceti showed the same solidif. pt. (45·75° C., with a rise of 0·05° C.)

after being repeatedly melted and re-melted, and rapidly or slowly cooled, and no differences were observed by varying the method of stirring or the use of tubes of different diameter (1¼ in. to ⅝ in.). Apparently the rate of crystallisation, change of viscosity, and rapid changes in density had no determining influence, the lowest (stationary) temperature depending on the solidified layers of the wax increasing the non-conductivity of the wall of the tube. The critical point at which opacity began on cooling and ceased on heating ranged from 45·8° to 45·9° C. The m. pt. of the wax by the thermometer bulb method was 45·3° to 45·5° C. and by the open capillary tube method 45·1° to 45·4° C., whilst the closed capillary tube method gave 45·9° to 46·0° C., and the opacity method 46·0° to 46·4° C. The presence of impurities (0·1% water, glycerin, or oleic acid) had no effect on the m. pt. or solidif. pt. The addition of 20% sperm oil lowered the m. pt. by 1·65° C., and the results were not affected by repeated melting and cooling, or by heating the mixture for a long time above its m. pt. With mixtures containing 95% sperm oil no solidif. pt. was observed on cooling to 14·5° C., but the opacity method gave the m. pt. as 23° C. and solidif. pt. as 26·5° C. In the case of such extreme dilutions no stationary point can be observed, and this accounts for discordant results obtained with mixtures of low m. pt.—C. A. M.

Fat analysis; Proposed uniformity in methods of —— [*for the leather industry*]. W. Fahrion. J. Amer. Chem. Assoc., 1915, **10**, 7—18.

A REPORT of the work of a commission appointed by the Internat. Assoc. of Leather Trades Chemists to study analytical methods for oils and fats used in the leather industry. Each member received samples of nine oils. The concordance in results was not so good as was expected. The acid values agreed well except in the case of cod oils, which alter during keeping. Mixtures of alcohol and petroleum ether, and alcohol and ether, were tried as solvents, using either aqueous or alcoholic alkali for titration. The results were the same as with the usual method. The author recommends titrating 5 grms. of oil in alcohol with $N/5$ or $N/2$ alkali. Saponification values are greater the longer the boiling, and the larger the quantity of water in the alkali. The author recommends using at least 3 grms. of oil, and alkali containing less than 10% water, and claims that saponification is complete with five minutes' boiling after a clear solution is obtained. Iodine values by the Hübl, Wijs, and Hanus methods were reported. Results by the Wijs method were in excellent agreement, whilst the Hübl results showed differences up to 26. The author recommends the abandonment of the Hübl method. The values by the Hanus method lie between the results given by the other two methods. In the determination of unsaponifiable matter the author washes the solution of soap in petroleum ether with 50% alcohol, which does not dissociate the soap. Unsaponifiable matter from fish oils should not be dried above 100° C. The results obtained in the analysis of dégras show good concordance.—F. C. T.

Soaps. Board of Trade Bulletin No. 20.

THE exports of soap from Germany in 1912 were: common soft soaps, oils and liquid greases (for cleansing), Turkey red oil, creoline and similarr cleansing, etc., materials, liquid soap substitutes, £117,200 (£8800 to the United Kingdom); hard soap, creoline and similar cleansing and polishing materials, greasy lye-meal, soap substitutes not included under the following heading, £32,400 (£8,000 to the United Kingdom); soaps, etc., shaped for use or in boxes, bottles, etc., liquid soap other than that specified above, soap powder, soap in leaves (soap-paper), soap substitutes not otherwise specified, moulded soap wares, £301,600 (£23,300 to the United Kingdom); total, £451,200. From Austria-Hungary (1913): Turkey red oil, £1500; other common soaps, £14,300; fine soaps, *i.e.*, scented soaps or soaps in tablets, balls, boxes, jars, £92,400 (£1100 to the United Kingdom); total, £108,200. From the United Kingdom (1913): soft soap, £31,400; household and laundry soap in bars or tablets, £1,598,500; polishing and scouring soap, £14,000; soap powder, £28,000; toilet soap, £412,500; unenumerated soap (including cotton-seed oil soap), £8,300; total, £2,092,700.

As regards household and laundry soap the exports from the United Kingdom are already so large that it would seem that there is little to be gained in this line, but there is scope for increasing the exports of the finer kinds of soaps. The exports of this class of soaps from Germany and Austria-Hungary in a recent year were: from Germany (1912): soaps shaped for use, etc., soap powder, moulded soap wares, etc., Australia, £12,000; China, £12,400; Japan, £10,200; Turkey, £5000; Dutch East Indies, £37,500; Argentina, £14,400; Brazil, £5100; United States, £7600: from Austria-Hungary (1913): fine soaps, India, £23,000; Bulgaria, £3000; Italy, £1500; Roumania, £1100; Turkey in Europe, £7700; Turkey in Asia, £3400; China, £18,000; Japan, £2600; Egypt, £5100; U.S.A., £900.

Candles. Board of Trade Bulletin No. 89.

THE total value of candles of all kinds exported from Germany in 1912 was £56,600; from Austria-Hungary (1913), £14,000; and from United Kingdom (1913), £435,000. The exports of the three countries to the principal Colonial and neutral markets reached the following amounts: Germany, £43,600 in 1912; Austria-Hungary, £10,095 in 1913; and the United Kingdom £95,415 in 1913. The United Kingdom holds a particularly strong position in the Argentine, South African, Canadian, Portuguese, Chinese, Chilean, and Colombian markets. Germany, however, does the bulk of the trade with Denmark, Switzerland, Russia, Mexico and Brazil, while the German competition is much in evidence in Norway, Netherlands, Spain, Italy, Turkey, Egypt, United States, and Cuba. Austrian competition is chiefly confined to the Balkan States, Russia, Turkey, and Egypt, and in these latter markets the share of the United Kingdom in this trade leaves considerable room for expansion. It would appear that the maximum value of the export trade in candles to the markets specified which might be diverted to British manufacturers from their German and Austro-Hungarian rivals was:—German trade (1912), £43,600; Austro-Hungarian trade (1913), £10,095.

Report on the work of the Kautschuk-Zentralstelle, April 1913—*April* 1914. [*Manihot seed and kapok seed oils.*] Frank and Marckwald. *See* XIV.

Determination of unsaponifiable matter, applicable to ether extracts, fats, oils, and waxes. Rather. *See* XIXA.

Lubricating oils and greases. Board of Trade Bulletin. *See* IIA.

PATENTS.

Oils; Method of and apparatus for deodorising —— and distilling and vaporising liquids. J. T. Bateman, London. Eng. Pat. 367, Jan. 6, 1914.

THE oil is heated in a tubular heater, and then conveyed to a deodorising vessel, which may form one of a series of superposed chambers, each of

which contains a perforated, dome-shaped diaphragm. The oil flows downwards through gutters coiled around the diaphragm, and superheated steam, admitted beneath the dome, escapes through perforations directly into the gutters, thus ensuring intimate contact with the oil. The steam is then deflected to the bottom by a dome-shaped cover surrounding the diaphragm, and rises outside the cover and passes beneath the diaphragm of the chamber next above, and so on, until it escapes from the top chamber, carrying with it the volatilised fatty acids and aldehydes. Thence it passes through a chamber containing a turbine or the like with curved vanes, to separate any oil spray, and afterwards through the tubular heater to heat the incoming oil. The deodorised oil is drawn off from the bottom chamber and cooled.
—C. A. M.

Grease; Apparatus for purifying waste ——. G. E. Thomas, Swansea, G. L. Evans, Lampeter, and T. A. Goskar, Swansea. Eng. Pat. 3422, Feb. 10, 1914.

WASTE "hot-neck" grease is melted in an open vessel, and, after separation of heavier impurities, is passed, at a higher temperature and under pressure, in a thin uniform stream over a magnet, which may be provided with means for automatic cleaning. It is then cooled while still under pressure and forced into receptacles at atmospheric pressure. If necessary, the grease is thinned with a suitable solvent, which is subsequently distilled and condensed.—C. A. M.

Unsaturated fatty acids and their glycerides; Process for the catalytic hydrogenation of ——. C. und G. Müller Speisefettfabrik A.-G. Fr. Pat. 470,364, March 28, 1914. Under Int. Conv., June 20 and Sept. 29, 1913.

A CATALYST consisting of a nickel salt of an inorganic acid not volatile at the temperature of hydrogenation (*e.g.* nickel borate or silicate) is mixed with the fatty acids, etc., and the mixture heated in a current of hydrogen. The nickel salts are preferably heated in a current of hydrogen before use.—C. A. M.

Unsaturated oils and fats; Hydrogenation of liquid or liquefied substances and especially —— and their rapid transformation into hard saturated products. J. David. Fr. Pat. 470,392, June 14, 1913.

HYDROGEN under pressure is forced into the lower part of the first of a series of connected cylinders containing the mixture of melted fat and catalytic agent. The fat is thus intermittently projected upwards and falls from depending plates, preferably of nickel, into the current of gas, whilst a hot-air jacket maintains the temperature at 150°—200° C. The hydrogen passes through several of the cylinders before being returned to the gas-holder to be purified, compressed, and used again.
—C. A. M.

Lubricating and like oils and fats; Process and apparatus for purifying used ——. L. J. Noel, Epernay, France. Eng. Pat. 4428, Feb. 20, 1914. Under Int. Conv., May 19, 1913.

SEE Fr. Pat. 458,049 of 1913; this J., 1913, 1021.

Ozone; Treatment of liquids, oils, and melted fats with nascent ——. Soc. Electricité et Ozone. Fr. Pat. 470,316, March 30, 1914. Under Int. Conv., April 10, 1913.

SEE Ger. Pat. 273,935 of 1913; this J., 1914, 798.

Process for effecting catalytic reactions [hydrogenation]. Fr. Pat. 471,108. *See* I.

[Perborate] washing [and bleaching] compounds. Eng. Pat. 24,625. *See* VII.

Method of making [metallic] catalysts [from formates]. U.S. Pat. 1,122,811. *See* X.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Linoleum and oilcloth. Board of Trade Bulletin.

EXPORTS of linoleum and oilcloth from Germany during 1912 were as follows: oil-cloth, £109,650; tissues coated with celluloid, etc. (pegamoid, etc.), £10,900; floor coverings of linoleum or similar materials: (*a*) made from a monochrome mass, not printed, £165,800, printed, £65,250; (*b*) made from a mass of more than one colour, £385,050; wall hangings, linerusta, etc., of linoleum or similar substances, £21,650; total, £785,300; from Austria-Hungary (1913): floor coverings of oilcloth, linoleum, kamptulicon, and similar compositions, £20,070; oilcloth, not specially mentioned, also waxed muslins and waxed taffeta, and goods in the piece with designs for cutting into lengths, £76,440; total, £96,510; from the United Kingdom (1913): oilcloth for floor coverings, £1,870,000; oilcloth for furniture coverings, £666,000; oilcloth for all other purposes, £96,300; total, £2,632,300.

The largest markets to which Germany exports linoleum and oilcloth are Scandinavia (£135,650) and United States (£108,600), whilst large exports are sent to South America, France, United Kingdom, and Japan.

The exports of oilcloth, etc., from Austria-Hungary are much smaller than those from Germany, and go largely to South-Eastern Europe and the Levant, whilst other principal markets are the United Kingdom, Argentina, and Sweden.

The exports of oilcloth from the United Kingdom to the principal German and Austrian markets are three times as large as the combined exports from these two countries. At the same time, an opportunity is now afforded for British exporters of this commodity to extend their business in several markets, notably in the case of Scandinavia, South America, Japan, and the United States—whilst the £53,220 worth of linoleum and oilcloth formerly purchased from Germany and Austria-Hungary by the United Kingdom should be replaced by British-made goods.

PATENTS.

[Lead oxide] pigments; Process of making ——. C. D. Holley, St. Louis, Mo., Assignor to Acme White Lead and Color Works, Detroit, Mich. U.S. Pat. 1,123,743, Jan. 5, 1915. Date of appl., Oct. 25, 1910.

FINELY-DIVIDED lead is moistened with water containing nitric acid equal in amount to about 1% of the weight of lead, and the mass is allowed to undergo spontaneous oxidation by air to form hydrated oxides, which are afterwards heated to obtain an oxide—litharge, massicot, or red lead.
—E. W. L.

Films of oil or oil paint; Preparation of ——. Oel- und Farbfilm A.-G. Fr. Pat. 471,158, Apr. 20, 1914. Under Int. Conv., Dec. 9, 1913.

THICK, lightly-sized paper is coated on one side with varnish and on the other with an alkaline solution (*e.g.* water-glass). The drying oil or paint is applied to the alkaline surface, and the film, when dry, can be readily detached and transferred to any other surface, where it will adhere without the addition of an adhesive agent.
—C. A. M.

Condensation products of formaldehyde and phenol with coal tar, turpentine, and other organic substances; Hard ——. K. Tarassoff. Fr. Pat. 470,810, Apr. 11, 1914.

THE condensation is effected in the presence of "sulpho-aromatic fatty acids" or of sulphonated fats or fatty acids, or of sulphonic acids obtained by the sulphonation of petroleum, petroleum distillates, or other hydrocarbon oils. In presence of the sulphonated derivatives mentioned, homogeneous, hard condensation products can be obtained from mixtures of such substances as coal tar, wood tar, turpentine, fatty oils, etc., with phenol and formaldehyde. (See also Eng. Pat. 528 of 1914; this J., 1914, 557.)—C. A. M.

Lacquers containing cellulose derivatives; Manufacture of ——. F. Lehmann. Fr. Pat. 471,104, Apr. 18, 1914. Under Int. Conv., Apr. 21, 1913.

CELLULOSE esters are dissolved in appropriate solvents containing a solution of coumarone resin (see Fr. Pat. 469,925; this J., 1915, 25) and the mixture is diluted with alcohol, benzene, petroleum spirit, etc.—J. F. B.

Lacquers and varnishes from paracoumarone and para-indene; Manufacture of ——. R. Lender. Ger. Pat. 277,605, Feb. 8, 1913.

PARACOUMARONE or para-indene, or a mixture of the two, with or without addition of an animal or vegetable oil, is heated with sulphur or sulphur chloride at atmospheric or higher pressure, and the product is dissolved in a volatile solvent.
—A. S.

Pigments; New —— and products for the manufacture of the same. Badische Anilin und Soda Fabrik. Fr. Pat. 470,682, April 8, 1914. Under Int. Conv., May 17, 1913.

SEE Eng. Pat. 20,106 of 1913; this J., 1914, 652.

Process of obtaining zinc oxide. Fr. Pat. 470,321. *See* VII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Diffusion of carbon dioxide through ——. V. Rodt. Chem.-Zeit., 1914, 38, 1249—1251.

A VULCANISED rubber tube, filled with carbon dioxide and closed at both ends, will collapse, owing to the escape of the gas through the rubber, in a comparatively short time (say 12—24 hours), and the collapse is hastened very much by immersing the tube in water. If, however, the dry tube is filled with dry carbon dioxide, and kept in a dry atmosphere (over phosphorus pentoxide), no collapse takes place in a month, although little carbon dioxide remains in the tube at the end of that time. Carbon dioxide is not absorbed by vulcanised india-rubber to any appreciable extent even in a moist atmosphere. A sample of rubber thread left in an atmosphere of moist carbon dioxide for 25 days showed an increase in weight of 6·3%, of which 6·12% was due to water, and only 0·08% to carbon dioxide. The rapid diffusion of carbon dioxide through a rubber septum is attributed to the relatively high solubility of the gas in water, combined with the "hygroscopic" nature of rubber. A solution of the gas in the absorbed water is formed on the inner side of the septum, and this, diffusing to the outer side—the region of lower concentration of carbon dioxide—through the pores of the rubber, yields up its carbon dioxide to the air.—E. W. L.

Kautschuk-Zentralstelle; Report on the work of the —— for the year April 1913—*April* 1914. F. Frank and E. Marckwald. Chem.-Zeit., 1914, 38, Rep., 587.

THE nitrogenous substance in raw rubber and in the latex is a true protein, showing all the characteristic reactions, and yielding, on complete hydrolysis, monoaminoacids, aromatic and heterocyclic aminoacids, diaminomonocarboxylic acids and, almost certainly, monoaminodicarboxylic acids and cystin. The fruits of the baobab tree were found to contain considerable quantities of malic acid and of pectin. *Manihot* seed yielded husks, 55, and kernels, 45%; the kernels yielded about 55% of a drying oil, free from injurious bitter principles, suitable for varnish making and probably also as an edible oil. *Kapok-seed oil* (see this J., 1913, 874, 917) appears to be suitable for soap and factice manufacture, and might also replace cottonseed oil in food products; the oil-cake would probably be a useful fodder. The manuring of rubber trees has so far had no effect upon the quality of the rubber, but has increased the girth and yield of the trees. A further warning is given against the use of vegetable juices for coagulating *Manihot* rubber, and growers are again advised not to wash their rubber before shipment. A "blue rubber" from the Cameroon was improved in colour and freed from mould by the use of "Purub" (hydrofluoric acid). A *Ficus* rubber from New Guinea, otherwise normal, contained an exceptionally low percentage (4·1) of resins.—E. W. L.

Rubber wares (other than machinery belting, tyres for cycles, motor cycles and motor cars, and toys). Board of Trade Bulletin No. 81.

THE value of rubber wares (other than machinery belting, tyres for cycles, motor cycles and motor cars, and toys) exported in a recent year was: from Germany in 1912, £3,679,300; from Austria-Hungary (1913), £418,150; and from the United Kingdom (1913), £2,948,900.

The German exports to Austria-Hungary and United Kingdom (1912) amounted to £1,139,150; Austro-Hungarian exports to Germany and United Kingdom (1913), £139,240; and United Kingdom exports to Germany and Austria-Hungary (1913), £248,400.

The value of rubber goods exported from each of these countries to markets common to each was: from Germany (1912), £2,540,150; from Austria-Hungary (1913), £278,910; from United Kingdom (1913), £2,700,500.

The rubber wares included in the exports from Germany (1912) were: rubber solution, £44,100; soft rubber paste; rolled sheets of the same; cuttings and strips of rubber, unmanufactured; gutta-percha paper, £172,200; cut sheets (patent sheets) of rubber, not vulcanised, unmanufactured, £10.750; rubber threads, £46,400; rubber tubing (other than motor car, motor cycle, and cycle tyres), £413,700; rubber boots and shoes, £8550; rubber tyres for wheels of vehicles, £615,950; wares of soft rubber, not elsewhere mentioned; rubber sheets combined with spun materials, etc., £1,003,500; rubber print cloths for factories; card cloths for carding factories, £8100; spun wares with rubber or rubber threads; rubber wares with spun materials, £367,550; hardened rubber paste for dental purposes, £11,700; hardened rubber in plates and bars, rough-pressed goods, etc., of hardened rubber, not further worked, £89,900; tubes of hardened rubber not further worked, £10,000; other wares of hardened rubber, except surgical instruments, £469,100; so-called rubber linen (collars and such like) of tissues coated with celluloid or similar materials, £103,200; clothes and cloaks coated or impregnated with rubber, £66,500; other sewn articles,

also saddlers' and bagmakers' goods coated or impregnated with rubber, £178,100.

The principal wares included in the Austrian exports (1913) were: rubber paste, £23,850; sheets of rubber or gutta-percha, unvulcanised, cut, coated, rolled (patent sheets), £14,100; wares made of patent sheets, not specially mentioned, vulcanised or not, combined or not with fine or common materials, £11,700; insulating material of patent sheets, vulcanised or not, £5130; rubber threads not covered with yarn (also flat, not more than 3 mm. wide), £6,200; tubing of or combined with rubber, with or without layers of tissues or inlaid wire, £26,000; boots and shoes of rubber, combined or not with textiles or with other materials, £56,100; wares of soft rubber, not specially mentioned, combined or not with ordinary or fine materials, £114,200; woven and knitted materials, covered, impregnated or coated with rubber, or with internal layers of rubber, £21,900; elastic tissues, knitted wares, and haberdashery consisting wholly or partly of silk, floss silk, or artificial silk, £25,400; shoe elastic, £34,860; other elastic tissues, knitted wares, and haberdashery, £19,100; hardened rubber (solid or hard as leather) in sheets, rods, and tubes, polished or not, but not further worked, £6800; wares of hardened rubber, not specially mentioned, rough pressed, the pressing seams being visible, £5800; other wares of hardened rubber, not specially mentioned, combined or not with common or fine materials, £24,200; fittings for technical and electro-technical purposes, of hardened rubber, £6700; clothing or other articles made with woven or knitted materials coated or impregnated with rubber, or with elastic tissues, etc., £13,200.

The United Kingdom exports in 1913 to the principal markets served by Germany and Austria-Hungary were: apparel, waterproofed, £927,125; rubber boots and shoes, £123,545; tyres, other than motor-car, motor-cycle, and cycle tyres, £124,626; rubber manufactures, other sorts, £1,431,074.

The United Kingdom holds a strong position in the markets of British South Africa, British India, New Zealand, Canada, Straits Settlements, and Australia, though German competition is now felt somewhat in the last two. In the Western European markets generally the German and British shares of the trade are roughly equal, though in Norway the United Kingdom takes the lead, while in Switzerland, Italy, and Russia the German products quite dominate the market. In the Balkan States, the bulk of the trade falls to Germany and Austria-Hungary. Germany takes the lead in supplying Persia and the Dutch East Indies, while the United Kingdom does the same in China and Japan. German competition in American markets is particularly keen, especially in Brazil, Argentina, Chile, the United States, and Mexico.

PATENTS.

Rubber and rubber products; Dyeing of ——. D. Spence, Akron, Ohio, Assignor to The B. F. Goodrich Co., New York. U.S. Pat. 1,122,653, Dec. 29, 1914. Date of appl., Feb. 10, 1913.

RUBBER is treated with an aqueous solution of an aromatic amine, and the absorbed amine is afterwards diazotised and combined with a suitable dye-component, so that an azo dye is obtained directly combined with or fixed upon the rubber. —E. W. L.

Rubber; Art of treating [vulcanising] ——. L. C. Warner, Naugatuck, Conn., Assignor to The Beacon Falls Rubber Shoe Co., Beacon Falls, Conn. U.S. Pat. 1,122,824, Dec. 29, 1914. Date of appl., March 17, 1913.

RUBBER articles to be vulcanised are placed on forms in a heated vulcanising chamber, the chamber is closed, and the pressure inside is reduced, in order to facilitate the escape of liquid and gaseous matter within and upon the articles. The pressure is subsequently raised and the articles vulcanised by heating to a higher temperature.—E. W. L.

Rubber; Process for vulcanising ——. J. Bastide. Fr. Pat. 470,883, June 24, 1913.

To ensure a more uniform distribution of the sulphur in a rubber mixing, and so reduce the amount of sulphur necessary for vulcanisation as nearly as possible to that actually combined in the vulcanised rubber, a suitable solvent of sulphur is added to the mixing before vulcanisation. Examples of such solvents are the methylene and ethylene compounds of fatty and aromatic amines, notably methylethenylphenylenediamine-1.2.3, methylenediphenyldiamine, and phenyliminomethane. The following examples of mixings are given:—(1) Good quality rubber, 55; zinc oxide, 40; lampblack, 1·5; solvent, 2; and sulphur, 1·5%. (2) Para rubber, 83; mineral red, 12; solvent, 2·5; and sulphur, 2·5%. These mixings can be vulcanised under the same conditions of temperature and pressure as similar mixings containing 5 to 8% of sulphur but no solvent.—E. W. L.

Rubber; Purification by dialysis of raw and reclaimed —— and other materials soluble in hydrocarbons. H. Debauge. Third Addition, dated April 9, 1914, to Fr. Pat. 426,457, Feb. 3, 1911. (See this J., 1911, 968; 1912, 35 and 1043.)

THE rubber, which has been soaked in cold xylene, is introduced into a vertical steam-jacketed dialysing vessel, together with sufficient xylene to produce ultimately a 5—10% solution of rubber. The vessel is divided, by a sheet iron partition, into a central space, in which a vertical shaft, provided with long vertical blades, runs at a high speed, and an annular space surrounding it which contains the porous dialysing tubes. A small screw at the base of the central shaft causes the rubber and solvent to circulate downwards through the centre compartment and upwards around the dialysing tubes, through which a slow constant flow of solvent is kept up. The grinding action between the rubber particles, the walls of the centre compartment, and the blades, greatly assists the solution of the rubber and removal of the dialysable impurities.—E. W. L.

[Rubber] latex; Apparatus for the treatment of ——. H. A. Wickham. Fr. Pat. 471,231, April 22, 1914. Under Int. Conv., Jan. 31, 1914.

SEE Eng. Pat. 2627 of 1914; this J., 1915, 40.

Rubber substitute for waterproofing and similar operations and process of making the same. G. d'Almeida. Fr. Pat. 470,372, April 1, 1914.

SEE Eng. Pat. 14,665 of 1912; this J., 1913, 799.

XV.—LEATHER; BONE; HORN; GLUE.

Chrome leather; Analysis of —— and of materials used in its manufacture. L. Balderston. J. Amer. Leather Chem. Assoc., 1915, 10, 45—52.

A COMMITTEE appointed by the American Leather Chemists' Association recommends that the methods given in Procter's "Leather Industries Laboratory Book" for the determination of chrome and acid in chrome liquors, and the methods of Levi and Orthmann for the determination of chrome in chrome leather be incorporated in the printed methods of the Association. The methods of Levi and Orthmann are:—(*a*) The ash

from 3 grms. of leather is mixed with 4 grms. of a mixture of equal parts of sodium carbonate, potassium carbonate, and powdered borax glass, and fused for 30 minutes. The product is dissolved in hot water with sufficient hydrochloric acid to make the solution acid, and the solution is filtered, any insoluble matter being incinerated and treated as before with 1 grm. of the fusion mixture. The united solutions are diluted to 500 c.c., and 100 c.c. is treated with 5 c.c. of hydrochloric acid, and the chromium determined as described by Procter (*loc. cit.*). (*b*) When it is not desired to determine iron or aluminium, the ash from 3 grms. of leather is fused with 3 grms. of sodium peroxide in an iron crucible for 10 mins., and the crucible, after cooling, immersed in 300 c.c. of water, which is boiled for 30 mins. The solution is diluted to 500 c.c., filtered, and 100 c.c. treated with hydrochloric acid (5 c.c. excess), and the chromium determined by Procter's method.—A. S.

Tanning materials; Available tannin in various ——. J. H. Yocum and T. A. Faust. J. Amer. Leather Chem. Assoc., 1915, **10**, 26—41.

A RECORD of experiments in which tanning materials were leached and the resulting liquors and spent tans analysed. The total tannin in liquors and spent materials was always less than the tannin in the original material, by an amount between 8% and 14%, calculated on the original tannin.—F. C. T.

Celavinia and babla. Their properties, reactions, classification, and practical [*tanning*] *value.* H. G. Bennett. J. Amer. Leather Chem. Assoc., 1915, **10**, 19—26.

CELAVINIA (pods supposed to be derived from *Caesalpinia tinctoria*) contains about 32% tannin and 19% soluble non-tannins, and gives a leather remarkably light in colour. It belongs to the sumac sub-group of pyrogallol tannins, but differs from sumac in containing no flavone, ellagitannic acid, or reducing agent capable of bleaching leather. No known qualitative reaction will distinguish celavinia tannin from gallotannic acid.

Babla is a vague term applied to the pods of various acacias. The tannin resembles sumac in many reactions, but gives a precipitate with bromine water and no reaction with nitrous acid. The positive deal-shaving reaction for phloroglucinol distinguishes it from other mixed tannins. Babla contains about 30% tannin and 17% soluble non-tannins, and gives a mellow, light-coloured, but rather spongy leather. In practical effect babla resembles gambier.—F. C. T.

Pentoses; Determination of —— in tanning materials. J. L. van Gijn and H. van der Waerden. Collegium, 1914, 711—714. J. Amer. Leather Chem. Assoc., 1915, **10**, 70. H. C. Reed and A. Schubert. J. Amer. Leather Chem. Assoc., 1915, **10**, 61—63. (See this J., 1914, 151, 152, 558, 839.)

THE observation by Reed and Schubert that a cold water extract of quebracho wood gives methylfurfural on distillation with hydrochloric acid, could not be confirmed by van Gijn and van der Waerden. It is agreed that methylpentoses are not decomposed into pentoses by heating under pressure, and that methylpentoses are extracted more readily than pentoses from tanning materials. On this ground, Reed and Schubert maintain that the method of extraction influences the test. The addition of organic acids to mangrove extract does not give rise to furfural on distillation with hydrochloric acid, nor, as Moeller maintains, can methylfurfural be found in the distillate from the evaporation of mangrove extracts.—F. C. T.

Tanning materials [*mangrove*]*; Determination of —— in admixture.* F. H. Small. J. Amer. Leather Chem. Assoc., 1915, **10**, 41—45.

THE determination of mangrove in admixture by the estimation of methylfurfural, after digesting the tanning extract with hydrochloric acid and distilling (this J., 1914, 151, 152), is not satisfactory. The yield of methylfurfural is variable in parallel experiments, and the temperature of extraction in manufacture has great influence. The treatment of sulphited extracts with iodine before analysis is useless. (See also preceding abstract.)—F. C. T.

Sulphite-cellulose extracts; Analysis of ——. J. Paessler. Chem.-Zeit., 1914, **38**, 974.

SULPHITE-CELLULOSE extracts analysed by the Official Method of the Internat. Assoc. of Leather Trades Chemists, gave results varying within 10% according to the strength of the solution used for analysis, although such strengths were within the official limits of 0·35 to 0·45% of tanning matter. In control experiments with vegetable tanning materials variations in the strength of the solution taken for analysis within these limits, had no influence on the results. The German Section of the Association has decided that the strength of the solution of sulphite-cellulose for analysis should be 20 grms. of extract per litre.—T. C.

Sulphite-cellulose; Detection of —— in tanning extracts and in leather. W. Appelius and R. Schmidt. Ledertechn. Rundschau, 1914, **6**, 225—226. Z. angew. Chem., 1914, **27**, Ref., 691.

BOTH catechol- and pyrogallol-tannins give, with cold cinchonine sulphate solution, precipitates which redissolve on warming. Sulphited extracts give a precipitate which is not completely soluble on warming unless the extract is first boiled with hydrochloric acid and filtered before adding the cinchonine sulphate. The precipitate obtained with sulphite-cellulose extract and cinchonine sulphate forms, on heating, a characteristic insoluble brownish-black mass which is quite distinctive, even in solutions of vegetable tannins or in leather infusions containing only little sulphite-cellulose extract. Neradol D also gives with cinchonine sulphate a precipitate insoluble on warming, which, however, does not form a brownish-black mass, but more resembles a silver chloride precipitate.—T. C.

Sulphite-cellulose; Use of cinchonine for the detection of —— [in tanning extracts]. W. Appelius and R. Schmidt. Collegium, 1914, 706—707. J. Amer. Leather Chem. Assoc., 1914, **10**, 64—65.

THE test described previously (see preceding abstract) depends upon the fact that the presence of tannin prevents the precipitate given by sulphite-cellulose and cinchonine from being dissolved on heating. In the case of pure sulphite-cellulose extracts, tannin solution must be added before making the test.—F. C. T.

Wood gum (xylan); Determination of —— in chestnut wood extract. L. Pollak. Collegium, 1914, 715—716. J. Amer. Leather Chem. Assoc., 1915, **10**, 65.

XYLAN is found in many woods, especially in beech, and is extracted by dilute acids or caustic soda, but not by water. It was extracted from chestnut wood by Wheeler and Tollens' method (this J., 1890, 309), the wood being freed from tannin by three extractions of 24 hrs. each with 2% ammonia, then extracted with 5% caustic soda for 48 hrs., and the sodium compound of the

gum decomposed by hydrochloric acid. The xylan was purified by dissolving in water and precipitating with alcohol. From 5·1 to 7·9% was obtained from four chestnut woods, the highest yield being from red Corsican wood and the lowest from a light-coloured wood which yielded the best liquors for clearing.—F. C. T.

Sulphuric acid in leather; Determination of free ——. J. Paessler. Collegium, 1914, 567—592. J. Amer. Leather Chem. Assoc., 1915, **10**, 67—70.

Two small pieces of leather, one about twice the weight of the other, are placed in equal quantities of water (200—300 c.c.) and frequently agitated during 6 hrs., and the acid which has diffused into the water is then titrated with $N/10$ barium hydroxide. The free acid originally in the leather can be calculated by the aid of the equation: $C_1/C_2=C_3/C_4$ where C_1 and C_3 are the concentrations of acid remaining in the pieces, and C_2 and C_4 the concentrations of diffused acid. The method is based on the fact that under the experimental conditions the ratio of the amount of acid remaining in the hide to that which diffuses into the water is constant. (See also this J., 1914, 365.)—F. C. T.

Chrome soap in chrome leather; The presence of ——. G. Hugonin. Collegium, 1914, 716—717. J. Amer. Leather Chem. Assoc., 1915, **10**, 64.

A CHROME soap prepared from chromic chloride was found to be soluble in pure benzene. Various chrome leathers were extracted with benzene, but none of the extracts contained any chromium, and it is concluded that chrome leather contains chrome soap only when it is insufficiently washed or partially neutralised after tannage.—F. C. T.

Mangrove bark in the Federated Malay States. Board of Trade J., Feb. 11, 1915.

THE Commissioner of Trade and Customs at Kuala Lumpur draws attention to the possibilities of the development of an import trade in cutch from the Federated Malay States. There is an area of about 250 square miles of mangrove forest on the coast of the States of Perak and Selangor. The predominant species are *Rhizophora conjugata, Rhizophora mucronata, Brugueria gymnorhiza, Brugueria caryophylloides, Brugueria parviflora, and Ceriops candolleana.* The whole forest is now a Government reserved forest and is systematically worked for firewood. No attempt has been made to work the mangrove bark for cutch. All the bark is at present a waste product, with the exception of a small quantity used locally in dyeing fishing nets and sails. The forests are intersected with innumerable creeks and streams, which render transport easy.

Proposed uniformity in methods of fat analysis [for the leather industry]. Fahrion. *See* XII.

PATENTS.

Skins; Process for unhairing ——. R. Vidal. Fr. Pat. 470,577, June 18, 1913.

SKINS are immersed in an emulsion of a hydrocarbon and a dilute solution of an alkali or alkaline-earth sulphide for a period up to two days, according to their weight.—F. C. T.

Skins; Treatment and preservation of —— before tanning. Clarendon Yocum Co. Fr. Pat. 470,774, April 10, 1914. Under Int. Conv., April 17, 1913.

SALT stains are avoided by the use of a mixture such as 97% of sodium chloride and 3% of normal sodium sulphite, which is applied to the fresh skins.—F. C. T.

Egg-yolk; Process for replacing —— in tanning. O. Röhm. Fr. Pat. 470,594, April 7, 1914. Under Int. Conv., April 8, 1913.

THE skins, before or after tanning with alum or with vegetable tanning materials, are treated with sulphonated oils or fats, which have been freed from soaps, *e.g.*, by dialysis, and mixed with volatile substances (toluene, ethyl acetate) soluble in oil.—F. C. T.

Leather; Treatment of —— to obtain greater durability and impermeability. A. Chesneau. Fr. Pat. 471,283, April 23, 1914.

THE leather is immersed for ten minutes in a mixture of stearine, paraffin wax, beeswax, and rosin at 80° C.—F. C. T.

XVI.—SOILS; FERTILISERS.

Swamp rice soils; The gases of ——. W. H. Harrison and P. A. Subramania Aiyer. Mem. Dept. Agric. India, 1914, **4**, 1—17.

INVESTIGATION of the action of the film of algæ present on the surface of swamp rice soil (see this J., 1913, 1165) on the swamp gases, showed that the film utilises the gases in such a manner as to bring about an increased output of oxygen from the film, leading to an increased root aeration. The film contains bacteria capable of oxidising methane and hydrogen and of assimilating directly methane and carbon dioxide. The changes result, directly or indirectly, in the production of carbon dioxide, which is in turn assimilated by the green algæ with the evolution of oxygen. The film acts as an oxygen concentrator producing a maximum oxygen concentration in the water entering the soil. The practice of green manuring, by increasing the output of the soil gases, brings about an increased activity of the film, resulting in an increased production of oxygen and root aeration. The oxygen concentration of the water entering the soil through the combined action of drainage and transpiration appears to be one of the main factors regulating the growth and yield of the rice crop.
—W. P. S.

Aluminium salts; Physiological action of —— on plants. E. Kratzmann. Chem.-Zeit., 1914, **38**, 1040.

THE colouring matter of red cabbage shoots was changed to blue when the plants were grown in Knop's medium containing 0·01% of aluminium nitrate. Aluminium salts diminished the starch content of *Elodea*, but not of *Spyrogyra* and *Lemna* as recorded by Fluri; there was no decrease in the starch content of roots growing in solutions containing aluminium salts. The diminution in starch content is due to the condensing (synthesising) enzymes being restrained whilst the hydrolytic enzymes are rendered more active, and to a weakening in assimilative powers (general poisoning). When starch-free leaves were placed in a 20% sucrose solution and kept in the dark, considerable quantities of starch were formed within a few days, but the formation of starch was inhibited completely when the sugar solution contained 1% of aluminium nitrate. The growth of higher plants was retarded by the presence of 0·05% of aluminium salts, but very small amounts of the latter (0·0001%) had a slight stimulating action. *Aspergillus niger* grew freely on a glycerol medium containing from 0·005 to 0·1% of aluminium sulphate (anhydrous) or aluminium chloride, but growth ceased when the medium consisted of

glycerol and peptone alone. Aluminium salts also had a distinct stimulating action on the growth of the prothallium of *Equisetum arvense*.—W. P. S.

Nitrogen [in fertilisers, etc.]; Comparison of the Gunning-Cooper method with the Kjeldahl-Gunning-Arnold method for the determination of ——. O. F. Jensen. J. Ind. Eng. Chem., 1915, **7**, 38—39.

THE Gunning-Cooper method, which was adopted in 1908 by the Association of Official Agricultural Chemists (U.S.A.), differs from the Kjeldahl-Gunning-Arnold method only by the use of 0·1—0·3 grm. of crystallised copper sulphate in place of metallic mercury. A comparison of the two methods with bone meal, dried blood, cyanamide, and linseed meal, showed that with either method digestion for 1—1½ hours gives a quantitative yield of ammonia, except in the case of dried blood, for which digestion for 2—3 hours is necessary with the Gunning-Cooper method. The latter method possesses several manipulative advantages over the Kjeldahl-Gunning-Arnold method, and is to be preferred especially when many determinations have to be made. (See also this J., 1910, 1412; 1913, 1131.) —A. S.

Phosphoric acid in superphosphate; Comparison of a few methods for total ——. C. A. Peters and A. G. Weigel. J. Ind. Eng. Chem., 1915, **7**, 39—40.

THE gravimetric method of the Official Association of Agricultural Chemists (U.S.A.), in which the phosphoric acid is precipitated first as phosphomolybdate and subsequently as ammonium magnesium phosphate, gives high results unless the solution is evaporated to dryness to remove silica before precipitation. The volumetric process of Pemberton, and the direct precipitation of the phosphoric acid as ammonium magnesium phosphate in presence of ammonium citrate or of citric acid (Wiley, "Principles and Practice of Agric. Chemistry," II., (1908), pp. 160, 88, and 98 respectively) all give results as accurate as those obtained by the modified official process and in about half the time.—A. S.

PATENTS.

Fertilizer; Process of obtaining —— *[from the combustion products from gas engines]*. W. H. Heine, Honolulu, Hawaii. U.S. Pat. 1,122,923, Dec. 29, 1914. Date of appl., May 28, 1913.

PRODUCTS of combustion from a gas engine are cooled and brought into contact with lime-water, which is circulated in contact with the gases until the desired amount of fertilising substances has been absorbed.—W. P. S.

Treatment of marine plants for the extraction of their constituents. Addition to Fr. Pat. 470,943. *See* VII.

XVII.—SUGARS; STARCHES; GUMS.

Beet] sugar factory products; Determination of dry substance in ——. O. Fallada. Oesterr.-Ungar. Zeits. Zuckerind., 1914, **43**, 695. Chem.-Zeit., 1914, **38**, Rep., 568. (See also Fallada and Kulp, this J., 1912, 549.)

THE following conclusions are drawn from determinations made on 44 different products by various methods:—The Abbe refractometer and the modified instrument of Schönrock and Herzfeld (this J., 1914, 154) give practically identical results (cp. Pellet, this J., 1914, 1165). The values obtained by drying, in air at 100° C.; in a vacuum oven at 108° C.; and in air at 100° C. and afterwards *in vacuo* at 108° C., often differ considerably, but the last method accords best with the refractometer. The refractometric method is the simplest and most trustworthy, provided the correct temperature (20° C.) is maintained, and a good source of light (*e.g.*, the Nernst microscope lamp) is used.—J. H. L.

[Reducing sugars;] The volumetric Fehling method [for the determination of ——,*] using a new indicator*. A. M. Breckler. J. Ind. Eng. Chem., 1915, **7**, 37—38.

TEN c.c. of mixed Fehling solution [(1) 34·639 grms. of crystallised copper sulphate, and (2) 173 grms. of Rochelle salt and 50 grms. of sodium hydroxide, per 500 c.c.] is placed in a large test-tube and the sugar solution (0·2 to 0·4 grm. of dextrose, or its equivalent, per 100 c.c.) run in, starting with 8·5 c.c. After the first addition the solution is boiled for 1 min., counting from the time a bubble of steam first traverses the whole column of liquid. The sugar solution is now added 2 c.c. at a time, boiling for 15 seconds after each addition, until the copper solution is only faintly blue, whereupon a drop of it is added to two drops of sodium sulphide solution (4 grms. of crystallised monosulphide in 100 c.c. of water) on a tile. The tile is given a slight rotary shake and the colour of the spot noted: the black copper sulphide settles at once, leaving a yellow supernatant liquid. The sugar solution is now added in gradually decreasing quantities, boiling for 15 seconds after each addition, until the supernatant liquid in the spot test, immediately after settling, is colourless. The experiment is then repeated with a second 10 c.c. of Fehling solution, adding enough water to make the final volume about 30 c.c. and 97—98% of the sugar solution required in the previous trial. After boiling for 1½ minutes, the titration is completed as described. Proteins and metals which form coloured sulphides interfere with the spot test: the former may be removed by adding alumina cream to the boiling sugar solution, cooling, and making up to a definite volume, the clear liquid being used after settling or filtering.—A. S.

Starch. Board of Trade Bulletin No. 95.

THE value of starch of all kinds exported from Germany in 1912 was £555,200; from Austria-Hungary (1913), £46,010; and from the United Kingdom (1913), £88,200. The German exports to Austria-Hungary in 1912 were valued at £31,650 and to the United Kingdom at £226,900; Austro-Hungarian exports in 1913 to Germany were valued at £10,130, and to the United Kingdom at £8150; while the exports of the United Kingdom in 1913 to Germany were valued at £1300. No starch was exported to Austria-Hungary from the United Kingdom in 1913. The value of the exports to the principal Colonial and neutral markets was: Germany (1912), £288,350; Austria-Hungary (1913), £27,580; United Kingdom (1913), £72,610.

The United Kingdom exports to British South Africa, India, Canada, and Australia considerably exceed those of Germany. In Brazil, Portugal, Egypt, and Turkey the share of the United Kingdom compares very favourably with that of Germany, but elsewhere it is distinctly inferior. Valuable openings exist for the sale of British-made starch in many markets hitherto mainly supplied by Germany or Austria-Hungary, particularly in Norway, Sweden, Denmark, Netherlands, France, Switzerland, Spain, Italy, Servia, Russia, Argentina, Chile, Uruguay, the United States, and Mexico. Of the total German exports,

potato starch, green fecula (wet starch), and dry potato starch powder (potato meal) accounted for £220,350; dextrine, roasted starch, adhesive and surface dressing substances containing starch, gluten and gluten powder, £187,100; rice starch, £117,750; and starches of maize, wheat, etc., £30,000. More than half of the total Austrian exports consisted of paste, size, and similar starch-containing sticking and dressing substances, and rice starch and rice starch meal.

Determination of sugar in small quantities of blood. Lewis and Benedict. *See* XXIII.

PATENTS.

Sugar; Preparation of ——, and apparatus for use therein. E. Shaw, and G. S. and G. R. Baker, London. Eng. Pat. 22,656 of 1914; date of appl., Nov. 25, 1913.

SYRUP or juice is sprayed by a blast of hot air into a heated enclosed chamber, whereupon graining takes place, the sugar being removed by scrapers, and the vapour drawn off through openings. The enclosed chamber is heated by a jacket, and the temperature of the syrup or juice, of the air, and of the chamber, are regulated according to the density of the syrup or juice, and the pressure of the air according to the size of grain desired.—J. P. O.

Sugar beets; Extraction of juice from fruits and roots, especially from ——. O. Mengelbier. Fr. Pat. 470,980, April 15, 1914. Under Int. Conv., May 15, 1913.

THE beetroots, crushed, or sliced into fairly large pieces, are pressed between two or more rollers, the greater part of the juice being thus extracted. The residue is macerated with water or juice, and again passed through roller-presses, the temperature throughout being kept sufficiently low to prevent decomposition.—J.P.O.

Gum from carob seeds [locust beans]; Process for obtaining —— in the form of a dry powder. A. Pinel. Fr. Pat. 470,899, June 26, 1913.

SEE Eng. Pat. 13,504 of 1914; this J., 1915, 43.

XVIII.—FERMENTATION INDUSTRIES.

Malt; Melanoidines and their occurrence in kilned ——. W. Ruckdeschel. Z. ges. Brauw., 1914, **37**, 430—432, 437—440. Z. angew. Chem., 1914, **27**, Ref., 681.

EXPERIMENTS made by the author confirm the view that the formation of colour and aroma during the kilning of malt is due to the production of melanoidines (see Maillard, this J., 1912, 144) by interaction between dextrose or other sugars and amino-acids or bases (cp. Ling, this J., 1908, 1034). With the exception of tyrosine, allantoin, and betaine, all the amino-acids which might occur in malt, and also the bases, ammonia, mono- and tri-methylamine, and choline, interact in this way with sugars. Polypeptides also yield deep brown products, but without specific aroma. The behaviour of aqueous extracts of green malt when evaporated, corresponds closely with that of solutions of amino-acids and sugars, as regards the rate of darkening, the stage at which an aroma is perceptible, the production of carbon dioxide, the increase of acidity, and phenomena arising from the colloidal nature of the melanoidines. The curing of malts is accompanied by a decrease in their content of amino-acids and polypeptides, owing doubtless to interaction with dextrose.

—J. H. L.

[Malt] extracts. L. Briant and H. W. Harman. J. Inst. Brew., 1915, **21**, 34—48.

THE influence of various factors on the quality and yield of extract from malt is discussed. Separate investigation of the fractions of malt grist, *viz.*, husks, grits, and flour, showed that whilst the flour yields the highest proportion of extract, with the highest specific rotatory power, the grits possess the greatest diastatic activity. The husks yield the largest proportion of soluble nitrogenous matter and possess the highest proteolytic activity, whereas in both these respects the flour is lowest. Laboratory worts made from the different fractions were hopped in proportion to their gravities, concentrated to equal gravities, and fermented. The beer from the grits was by far the best; that from the flour was very soft and somewhat characterless in flavour, though full in palate, and it retained its head well, but attenuation was backward. The beer from the husk fraction was thin and almost acid in flavour, and showed symptoms of unsoundness when stored. The efficiency of any form of modern grinding of malt depends largely on its capacity to reduce the interior of the grain to grits without undue disintegration of husks. The advantage of fine grinding lies not only in a higher yield of extract, but in its more rapid solution, which enables the mashing process to be curtailed, thus avoiding the lowering of quality of the extract by more undesirable matters dissolved during the later stages of a prolonged mashing. The limits of fineness of grist imposed by ordinary mash-tun practice may be obviated by the use of the mash filter. The authors discuss the production of flavour in malt, the use of coloured malts, raw grain adjuncts, brewing sugars, and hops, and the influence of carbonates in brewing waters (see Miskovsky, this J., 1911, 504). By using raw grain adjuncts it is usually possible to produce beers containing more extract, and better able to stand heavy priming, than beers from malt alone, yet when used in excess they may interfere with mash drainage and confer a "dry" flavour on beer. The high ash-content of certain grades of brewing sugars, which amounts to 4—5% or in other cases 7·5—8·5%, consisting largely of chlorides, probably affects the flavour and stability of beer and produces a fictitious increase in the gravity, since 1% of ash in solution corresponds nearly to 1 saccharometer lb. of gravity (cp. Baker and Hulton, this J., 1910, 644). For the treatment of waters of high carbonate-content, neutralisation with lactic acid gives satisfactory results, especially in the preparation of beers of soft palate; enzyme action is stimulated and the yield of extract usually increased by about 2 lb. per quarter.—J. H. L.

Barley; Respiration of ——. H. W. Harman. J. Inst. Brew., 1915, **21**, 48—65.

THE author investigated the effect of respiration upon barley during germination and withering, the minimum amount of air necessary, and the effect of replacing it at certain stages by inert gases. The steeped barley (1912 and 1913 Chevallier) was enclosed in a horizontal glass cylinder through which a current of purified moist air or other gas was passed, and the quantity of carbon dioxide formed was determined. The current of air employed was equivalent to 20 cubic feet per minute for 30 quarters of barley, *i.e.*, about 1/100 of that commonly employed in drum malting and about 20 times more than theoretically required for the quantity of carbon dioxide produced. Before being analysed the malt was dried in very thin layers for 48 hours at 100° F. (38° C.). The results of the main series of experiments are epitomised in the table, columns A and B referring to the same (1912) barley, and

the remaining columns to another (1913) barley. Columns A and B show that with restriction of the air the increase in the yield of malt is not equivalent to the lessened production of carbon dioxide and rootlets. Under the conditions of column E, root growth was very small and the yield of malt correspondingly greater; the long withering process did not stimulate the diastatic activity, and the resulting malts were unequally modified and remarkably rich in soluble nitrogen. Column F shows that warm steeping may give rise to diminished root formation and bad modification, and these conclusions were confirmed by practical maltings. From further experiments it was found that at the withering period forced conditions are enormously increased by rise of temperature and even more by the presence of carbon dioxide, *i.e.*, when the grain is allowed to stew and no respiratory current permitted; and this forcing of the malt depresses rather than increases the diastatic activity. The general conclusions drawn are as follows:—Slow but steady respiration is desirable throughout the whole germination, and under these conditions complete modification can be obtained with about 1/100 of the quantity of air commonly used in drum malting, and with no actual "withering" process. The effect of excessive aeration in increasing the malting loss is due much more to the greater root growth than to increased production of carbon dioxide, which is partially compensated by a gain in weight by oxidation. High temperatures during germination give rise to much greater respiratory losses than excessive aeration. The enormous excess of air commonly used in drum malting may be responsible for a lack of tenderness which characterises much of the malt so made. The rootlets are the primary controlling factors in modification and their healthy growth is in proportion to proper respiration at sufficiently low temperatures. The acrospire can be forced up the corn with little or no root, yet modification may still be incomplete. The action of withering should be confined to the removal of moisture and consequent shrinking back of the roots, at low malting temperatures. Moisture has no more specific influence on respiration than other general vital conditions; a deficiency may arrest modification by causing the roots to wither, whereas an excess will delay the natural withering process. The diastatic power appears to reach its maximum quite early (*e.g.*, within 5 days) when the temperature of germination is high, whereas at low temperatures its formation is gradual and progressive.—J. H. L.

100 *parts by weight of dry barley gave the following parts by weight.*

	A.	B.		C.		D.		E.		F.	
	Continuous air. Average	Intermittent air 1 hour in 24. Temp. 60° F. (15·5° C.)		Continuous air. Temp. 50°–68° F. (10°–20° C.)	Oxygen.	Continuous air. Temp. 48°–58° F. (9°–14·5° C.)	Continuous nitrogen.	Air, 5 days. Nitrogen, 7 days.	Air, 8 days. Nitrogen. 4 days.	Warm steep, 80°–85° F. Continuous air.	Cold steep, 65° F.
Dry malt	89·5	90·6	90·3	87·6	87·2	88·5	96·9	91·8	90·0	91·5	89·8
Dry roots	4·2	0·4	0·4	4·9	2·6	4·9	nil	1·6	2·8	1·8	4·2
Carbon dioxide produced—											
In 10 days	7·28	2·92	2·04	5·62	5·84	4·74	1·36	4·85	6·35	6·46	7·32
In 12 days	—	—	—	—	—	—	—	5·31	7·00	—	—
In 14 days	—	—	—	—	—	8·46	1·76	—	—	—	—
In 16 days	—	4·88	4·92	—	—	—	—	—	—	—	—
Diastatic power on dry malt	127°	90°	90°	98°	68°	109°	25°	105°	97°	71°	91°
Total matter soluble in cold water containing:—	22·0	10·18	11·20	20·60	15·30	18·40	4·40	18·80	19·60	12·20	17·70
Uncoagulable proteins	3·19	2·09	2·24	3·13	2·36	3·02	1·05	4·95	3·87	2·19	2·85
Reducing sugars expressed as dextrose	6·13	2·94	2·66	6·45	4·49	5·81	0·56	6·69	6·10	3·78	6·72
Sucrose	5·32	1·11	4·82	5·19	4·09	3·83	0·50	—	3·85	2·34	4·00

Wine; Determination of pentoses and methylpentoses in ——. F. Schaffer. Chem.-Zeit., 1914, **38**, 981.

METHYLPENTOSES occur in the unfermentable carbohydrates present in wines, but pentoses largely predominate, especially in natural wines. The pentoses may be expressed as arabinose and the methylpentoses as rhamnose; the ratio of arabinose to rhamnose is much narrower in the case of wines from grape marc and raisin wines than with natural wines. The phloroglucide method may be used for the determination of pentoses and methylpentoses in completely fermented wines; the small quantities of pentosans and methylpentosans present do not appreciably affect the results. When a wine contains more than 3 grms. of reducing substances per litre, it must be fermented previous to the estimation. The pentoses and methylpentoses may also be determined colorimetrically.—W. P. S.

Vinegar eels; Methods of destroying ——. J. F. Sacher. Chem.-Zeit., 1914, **38**, 1021—1022.

OUT of 25 samples of table vinegar taken from retail shops in Düsseldorf, 23 contained *Nematoidea* (vinegar eels). They can be killed and removed by heating the vinegar for a few minutes at 45° C. and filtering. Exposure to bright sunlight for several hours or complete exclusion of air for several weeks is also fatal, but carbon dioxide appears to be innocuous. In presence of 1% of sodium chloride, 2·5% of sodium sulphate, or 1% of sodium nitrate, the organisms succumb within a few days, but potassium and calcium salts have no effect. Acids are toxic in proportion to their degree of ionisation; 0·1% of hydrochloric acid proves fatal within a few days, whereas an equivalent quantity of boric acid has no action. It has been proposed to destroy the organisms by treating the vinegar with 0·1% of calcium peroxide or 0·2% of magnesium peroxide, but according to Wüstenfeld much larger quantities (0·5—2%) are required. Alcohol at low concentrations is not very toxic. —J. H. L.

PATENTS.

Drinks; Manufacture of ——. J. H. Brodrick, Bromsgrove. Eng. Pat. 15,533, Jan. 5, 1914.

TABLETS from which beverages (*e.g.*, of the type of ale, stout, etc.) can be prepared, are claimed, consisting of non-fermentable dextrinous malt flour (made from a specially prepared form of starch by heating to a high temperature), and 20—50% of dried extract from malt worts,

together with glucose, saccharin and flavouring matters, and preferably one or more ferments such as desiccated yeast. (See also Eng. Pats. 15,004 of 1896, 25,149 of 1898, 15,079 of 1905, 25,304 of 1909, and 27,572 and 27,573 of 1911; this J., 1897, 627; 1906, 491; 1912, 657, 1091.)
—J. H. L.

Wines; Manufacture of sparkling —— and all gaseous or fermented beverages, and their sterilisation by oxygen under pressure. A. Chaussepied. Fr. Pat. 470,539, June 17, 1913.

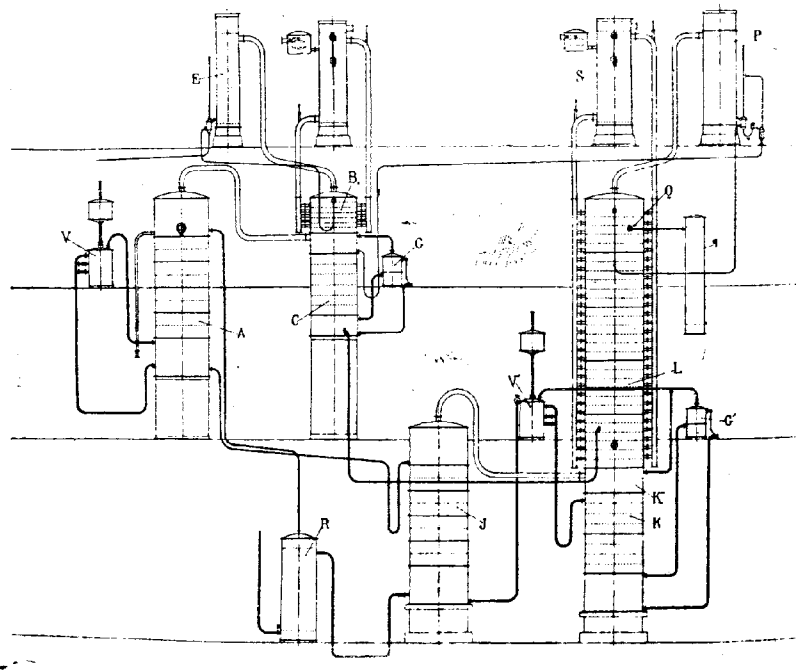
THE liquid is fermented, out of contact with air or metals, in a large closed vessel, and is agitated by injection of fermentation gases collected from above the liquid. The temperature is regulated by means of a coil within the closed vessel. When fermentation is complete, the liquid is sterilised by injection of oxygen under pressure. Before racking, the liquid is strongly cooled, so that the suspended matters form a compact deposit not drawn off with the liquid; the low temperature also prevents disengagement of gas during racking. The apparatus comprises a vat, open at the top, but completely encased in a hermetically closed vessel insulated against loss of heat and capable of sustaining a high internal pressure. The outer vessel extends above the vat, in a constricted form, thus providing a chamber in which the fermentation gases collect. Air or other gases can be forced through the liquid by means of a vertical tube, which extends nearly to the bottom of the vat, and the immersed portion of which is made of glass. By means of a pump the gas in the upper part of the outer vessel may be withdrawn and forced into the liquid through the same tube. The attemperating coil inside the closed vessel is not in contact with the liquid. The liquid is racked through a vertical pipe which projects to an adjustable extent above the bottom of the vat, and provision is made for counterpressure racking.—J. H. L.

Yeast; Manufacture of —— from [beet] molasses. G. Roth. Fr. Pat. 470,925, March 30, 1914. Under Int. Conv., April 2, 1913, and March 12, 1914.

BEET molasses is diluted to 35° Balling (sp. gr. 1·154), treated with 4% by vol. of sulphuric acid, boiled for several hours, and allowed to subside. The clear liquid is drawn off, diluted to 20° Balling (sp. gr. 1·083), treated with sulphuric acid to make the total acidity 6—10% by vol., aerated, filtered, and mixed, in the fermentation vats, with suitable nutrient salts or vinasse from a previous operation. A modification consists in forming lactic acid by treating the clarified solution contained in the fermentation vats with nutrient salts or vinasse, diluting to 14° Balling (sp. gr. 1·057), inoculating with lactic acid bacteria, and adding the yeast when the desired degree of lactic acidity is reached. Before starting the fermentation, suspended matter must be entirely removed from the solution, preferably without pressure, by the use of a filter having a large surface.—J. P. O.

Distillation and rectification of wines and fermented musts, methyl alcohol, etc.; Apparatus for the continuous ——. E. Barbet et Fils et Cie. Fr. Pat. 470,242, June 10, 1913.

THE apparatus (see fig.) combines efficiency of rectification, with the fuel economy associated with direct rectifying plant, the rectifying column being fed with alcoholic vapours direct from the wine and not with condensed distillates. The wine from the heater, R, passes downwards through the purifying column, A, where it is freed from head products, which pass into the accessory column, B, C, the more volatile part, after dephlegmation in B, being condensed in E, whilst the reflux from B is again freed from the more volatile constituents in C, and then passed into the main rectifying column, L. The wine, thus freed from head



products in A, passes downwards through the de-alcoholising column, J, and the alcoholic vapours are led into the rectifying column, K, L, the lower portion of which, K, serves to de-alcoholise the reflux from the upper portion. The plates in L (those in B are similar) form the subject of a separate patent application; they are cooled by water which circulates automatically through the pipes shown and the cooler, S, the whole system constituting a thermo-siphon. The alcohol vapours leave the column L at Q, and rectified alcohol is condensed in q; a certain quantity of head products escapes from the top of the column, and, after being condensed in P, is returned to the column B, C. The admission of steam at the bottom of the column, K, is automatically controlled by the differential regulator, G′, so that the pressure of vapour above the plates (at K″) is about equal to that of the vapours entering the column from J. G is a similar differential regulator, and V and V′ control the supply of steam to the bottom of the respective columns A and J. In a subsidiary apparatus (not shown) the fractions rich in amyl alcohol, drawn from the rectifying column, are washed by being allowed to rise slowly against a regulated downward current of water in a tall cylindrical vessel packed with porcelain balls. The wash waters are afterwards introduced into the rectifying column to recover any alcohol present.—J. H. L.

Enzymes of animal and vegetable origin; Separation of ——. M. Schoen, and Comp. Française du Diamalt. Fr. Pat. 471,238, July 4, 1913.

ANIMAL and vegetable juices are treated with tannin and the enzymes thus precipitated are filtered off and, if necessary, dried. The products may be subsequently dissolved by means of alkaline salts, and the purified enzymes recovered by precipitating the tannin, filtering, and evaporating the filtrates.—J. H. L.

Glycerin from distillery vinasses; Extraction of ——. E. A. Barbet. First Addition, dated June 10, 1913, to Fr. Pat. 449,961, Jan. 6, 1912 (see this J., 1913, 503).

FOR the recovery of the glycerin by distillation under reduced pressure (*loc. cit.*), a new form of retort is claimed which permits a reduction in the amount of inert matter mixed with the vinasse to prevent frothing, so that a residue richer in nitrogen is obtained. The retort, of shallow cylindrical shape, with floor and roof bulging outwards for greater strength, is heated by direct fire with the interposition of an arch of refractory material. Caramelisation of the vinasse is prevented by a continuous sweeping of the floor of the retort by a number of scrapers projecting downwards from two horizontal arms attached to a vertical rotating shaft which passes upwards through a stuffing-box in the centre of the roof of the retort.—J. H. L.

[*Lactic*] *acid fermentation; Process of promoting* ——. A. Pollak, Maisons Alfort, France. U.S. Pat. 1,123,920, Jan. 5, 1915. Date of appl., July 15, 1913.

SEE Fr. Pat. 459,548 of 1913; this J., 1913, 1166.

Alcohol; Manufacture of ——. F. Thatcher and L. M. Stiles. Fr. Pat. 470,298, March 31, 1914.

SEE U.S. Pat. 1,096,965 of 1914; this J., 1914, 659.

Brewing; Process of ——. E. W. Kuhn. Fr. Pat. 470,475, April 3, 1914. Under Int. Conv., April 15, 1913, and Jan. 3, 1914.

SEE Eng. Pats. 9170 of 1913 and 7456 of 1914; this J., 1914, 608.

Vinegar; New process for the manufacture of —— using a new mycoderma. H. Boulard. Fr. Pat. 470,937, June 27, 1913.

SEE Eng. Pat. 25,289 of 1913; this J., 1914, 881.

XIXA.—FOODS.

Milks; The freezing point of some abnormal ——. J. B. Henderson and L. A. Meston. Proc. Roy. Soc., Queensland, 1914, **26**, 85—90.

TWO samples of mixed milk were found to be low in solids-not-fat (7·74 and 7·79%, respectively), but at the same time had normal freezing points (—0·55° and —0·54° C.). The animals were badly fed and in poor condition. Analyses of the milk yielded by each cow (eight in all), showed that in only one case was this of normal composition, although here also the freezing points of the samples were within the normal limits, —0·54° to —0·56° C. The ashes of the milks contained abnormally high proportions of chlorine (up to 31%) and it is evident that the freezing point of the milks was adjusted to the norm 1 by the power of the mammary glands to regulate the osmotic pressure by the extraction of an increased quantity of sodium chloride from the blood in order to compensate for the deficiency in other constituents.—W. P. S.

Goat's milk in cow's milk; Detection of ——. J. Pritzker. Chem.-Zeit., 1914, **38**, 982—983.

THE test described depends on the different behaviour of the casein of the two milks towards ammonia. 22 c.c. of the milk is centrifuged at 1400 revolutions per minute for 5 to 10 mins., the separated cream removed, the skim milk then shaken with 2 c.c. of 25% ammonia, the mixture kept at 45° C. for 30 mins., again centrifuged for 5 mins., and the volume of the precipitate noted. In the case of goat's milk, this varies from 8 to 12 c.c.; cow's milk yields no precipitate, whilst mixtures of the two milks yield precipitates varying in volume according to the proportion of goat's milk present. Goat's milk which has been kept for 24 hours, or more, gives a smaller quantity of precipitate than does the fresh milk, but the addition of 0·1% of formaldehyde prevents this decrease.—W. P. S.

Unsaponifiable matter; New method for the determination of —— applicable to ether extracts, fats, oils, and waxes. J. B. Rather. Texas Expt. Stat. Bull. 169. J. Ind. Eng. Chem., 1915, **7**, 34—35.

PREVIOUS work by Fraps and Rather (cf. this J., 1912, 1092; 1913, 1024) having shown the need of a rapid method for the determination of unsaponifiable matter in ether extracts of fodders and the like, the following method was devised. About 0·4 grm. of the sample is boiled with 20 c.c. of 2*N* alcoholic sodium hydroxide for one hour under a reflux condenser, the mixture is evaporated nearly to dryness, treated with 3·5 c.c. of glacial acetic acid, and warmed with 50 c.c. of redistilled ether. After adding 25 c.c. of water and again warming for a minute, the mixture is transferred to a 500 c.c. separating funnel, the flask being rinsed with five successive 20 c.c. portions of ether. The aqueous layer is drawn off, the ethereal solution shaken gently with 10 c.c. of warm sodium hydroxide solution (1 : 2), and after allowing to settle, 25 c.c. of warm water is added, and the funnel rotated whilst held vertically. The clear aqueous layer is drawn off, and the operation repeated with five successive 30 c.c. portions of cold water. The ethereal solution is

finally evaporated and the residue dried at 100° C. With samples containing 25% or more of unsaponifiable matter, the quantity of fatty acids remaining dissolved in the ethereal solution is about 2 mgrms. and is balanced by a corresponding quantity of unsaponifiable matter in the aqueous soap solution. In the case of samples with high contents of fatty acids and very low contents of unsaponifiable matter, it may be assumed that 16 mgrms. of fatty acids remains dissolved in the ethereal solution; if more accurate results are desired, the ethereal solution, before evaporation, is washed with 20 c.c. of *N*/5 hydrochloric acid, and the evaporation residue, after weighing, is dissolved in 20 c.c. of alcohol and titrated with *N*/10 sodium hydroxide in presence of phenolphthalein, a control titration being made with the alcohol alone. The corrected number of c.c. of alkali multiplied by 0·028 gives the weight of fatty acids in grms., and this is subtracted from the weight of the evaporation residue of the ethereal solution. Results obtained by the method with a number of plant and animal products are tabulated.—A. S.

Fibrin. A. W. Bosworth. J. Biol. Chem., 1915, 20, 91—94.

PURE fibrin was prepared from ox-blood by repeated precipitation and solution, the product being finally washed with alcohol and ether and dried over sulphuric acid under reduced pressure; it consisted of a light, white powder containing 0·03% of ash, 17·21% N, and 0·95% S. It combines with bases to form a series of three acid salts containing one, two, and three equivalents of base, respectively, whilst a fourth salt, containing four equivalents of base, is neutral to phenolphthalein. All the compounds of fibrin with sodium, potassium, and ammonium are soluble. Calcium fibrinates containing three and four equivalents of calcium are soluble, but those containing one and two equivalents are insoluble. Fibrin combined with one equivalent of acid is insoluble and combined with more than one equivalent of acid is soluble. Unlike casein, fibrin is not capable of decomposing calcium carbonate. Carbon dioxide precipitates fibrin from a solution of calcium fibrinate, but not from a solution of sodium, potassium, or ammonium fibrinate. The molecular weight of fibrin is about 6666. (For analogous casein compounds, see this J., 1914, 609).—W. P. S.

Serum-albumin and glutin; Precipitation of —— by alkaloidal reagents. P. J. Hanzlik. J. Biol. Chem., 1915, 20, 13—24.

THE precipitation of dialysed horse serum and glutin by tannin is different from that brought about by other common alkaloidal reagents (iodine, potassium ferrocyanide, potassium mercuric iodide, sodium phosphotungstate, and sodium phosphomolybdate). With these a certain concentration of free acid is necessary for the formation of the complex insoluble compounds. Tannin behaves like certain hydroxy compounds, *e.g.*, resorcinol, phenol, quinol, and propyl alcohol, the maximum of precipitation with both serum-albumin and globulin corresponding with the isoelectric point. Precipitation of serum is not influenced by wide differences of concentration or by the presence of neutral salts such as potassium chloride and potassium thiocyanate.—W. P. S.

The Folin-Farmer method for the colorimetric determination of nitrogen. Bock and Benedict. *See* XXIII.

Determination of sugar in small quantities of blood. Lewis and Benedict. *See* XXIII.

PATENTS.

Milk; Manufacture of vegetable —— and its derivatives [from soya beans]. W. J. Melhuish, Upper Parkstone, Dorset. Eng. Pat. 24,572, Oct. 29, 1913.

FOR the production of about 100 litres of the milk, 15 kilos. of soya beans ground to a fine meal is mixed at 90° C. with 100 litres of previously boiled water and 20 grms. of potassium phosphate, this temperature being maintained with constant stirring for about ½ hour. After passing the liquor through a filter-press, the oil, which imparts an unpleasant taste to the liquid, is eliminated by means of a cream separator. Sesamé or other tasteless oil (about 3·6 kilos.), and butyric and other acids such as are usually found in cream, are next emulsified with the milk and 1875 grms. of dextrose, 2500 grms. of dextrin, and 625 grms. of sucrose, or 1500 grms. of maltose, 2500 grms. of dextrin, and 1000 grms. of sucrose, or 1250 grms. of lactose, 1000 grms. of maltose, 2500 grms. of dextrin, and 250 grms. of sucrose are added. The milk is mixed with 100—130 grms. of sodium bicarbonate, 50—70 grms. of sodium chloride, and 50 grms. of citric acid, and in order to impart a characteristic taste and aroma, and to cause it to separate into curds and whey at the end of a certain time, it is inoculated with a "cream starter," and allowed to stand until 100 c.c. require 4·5—7·5 c.c. of *N*/10 alkali for neutralisation. The milk is subsequently pasteurised, cooled to atmospheric temperature, and passed through a filter-cloth, being then bottled for use. Instead of treatment with the "cream starter," lactic bacteria cultivated in a small amount of the artificial milk may be used.—J. P. O.

Milk; Clarification of ——. B. R. Wright, Poughkeepsie, N.Y., Assignor to The De Laval Separator Co., New York. U.S. Pat. 1,122,457, Dec. 29, 1914. Date of appl., July 21, 1913.

MILK is delivered into the centre of a rotating centrifugal drum and passes through narrow passages to a peripheral space where the heavier impurities are deposited. The milk is then returned, in the form of a number of sheet-like streams, through other narrow passages towards the centre of the drum and the outlet. Clarification is thus effected without materially changing the distribution of the butter fat globules in the milk.—W.P.S.

Coffee extract; Water-soluble ——. M. C. Whitaker and F. J. Metzger, New York. U.S. Pats. (A) 1,123,827 and (B) 1,123,828, Jan. 5, 1915. Date of appl., July 19, 1912.

(A) ROASTED coffee is distilled with dry steam, and the residue extracted with an organic solvent to remove caffeine, and afterwards with water. The aqueous extract and the distillate are evaporated, and the residues are mixed to form a solid coffee extract. (B) Roasted coffee is distilled with dry steam, the distillate is extracted with ether, and the ethereal solution is mixed with a concentrated aqueous extract of the residual coffee; the mixture is then heated to remove the ether.—W. P. S.

XIXB.—WATER PURIFICATION; SANITATION.

Reduction of ferric sulphate in acid solution by means of cadmium amalgam for titration of iron and free sulphuric acid. Capps and Boies. *See* VII.

PATENTS.

Sludge from the clarification of waste liquids; Drying and gasification of ——. R. Nübling and A. Krauss. Fr. Pat. 470,848, April 14, 1914. Under Int. Conv., April 30, 1913.

THE process is carried out in a plant erected as a part of or alongside an illuminating gas plant or a destructor furnace, in order that the hot gases may be used as the source of heat required in the process. The sludge to be treated must not contain more than 25% of moisture. It is placed in horizontal, vertical, or inclined retorts, preferably mounted in a gas furnace or a destructor furnace as mentioned above. The gases from the carbonisation of the sludge are either led back to the retorts to be burned or are carried forward to the adjoining gas plant. The residual coke is used for mixing with town refuse as an aid to burning in the destructor.—J. H. J.

Sewage or other impure waters; Purification of ——. W. Jones, and Jones and Attwood, Ltd., Stourbridge. Eng. Pat. 729, Jan. 10, 1914.

THE sewage is purified in presence of air and cultivated sludge in an annular tank. Transverse depressions are formed in the floor of the tank at intervals and in each depression a plate is suspended so that the circulating sewage has to pass underneath the plate in each depression. Circulation is brought about by admitting compressed air at the bottom of each depression in such a way as to mix with the sewage on one side of the plate only. The upper part of the plate is so formed as to deflect the rising current horizontally towards the next depression.—J. H. J.

Waste waters; Clarification of ——. A. Hölken. Ger. Pat. 277,702, Sept. 6, 1913.

THE sludge separated from the waste liquid is incinerated and the residue lixiviated with water to obtain crude potassium carbonate, and then treated with acid to obtain a precipitant for the waste liquid. Before treatment with the precipitant the waste liquid is rendered alkaline with the potassium carbonate recovered from the sludge, together, if necessary, with potassium carbonate from other sources.—A. S.

Sewage, garbage, and the like; Treatment of ——. J. J. Smith, Brookline, Mass., Assignor to W. Nash, Marblehead, Mass. U.S. Pat. 1,123,414, Jan. 5, 1915. Date of appl., April 14, 1913.

THE drained solids from sewage or garbage are deodorised by mixing with charcoal and earth, and then dried by heating—J. H. J.

Water purifier. Maschinenbau-Anstalt Humboldt. Fr. Pat. 471,079, April 14, 1914. Under Int. Conv., Sept. 26, 1913.

THE water flows from an upper tank through a siphon into a lower one, where it is heated by the admission of live steam, and then through another siphon into a filter. The purifying reagent is placed in a box in the upper tank, and admitted as required. The whole action is regulated automatically by floats and valves.—J. H. J.

Sterilising liquids hermetically closed in bottles; Apparatus for ——. L. Giommi, Milan, Italy. Eng. Pat. 30,048, Dec. 31, 1913. Addition to Eng. Pat. 9912 of 1912 (this J., 1913, 622).

THE sterilising chamber is jacketed, and the jacket is divided into sections, means being provided for establishing different temperatures in the sections according to their level. A heating chamber is arranged concentrically within the sterilising chamber.—J. P. O.

Sewage and the like; Process for the treatment of ——. J. C. Butterfield, London, Assignor to E. A. Paterson, Port Arthur, Ont., Canada. U.S. Pat. 1,122,474, Dec. 29, 1914. Date of appl., March 24, 1913.

SEE Eng. Pat. 5921 of 1913; this J., 1914, 804.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Santal oil; Solubility of —— in alcohol. M. Baning and P. van der Wielen. Pharm. Weekblad, 1914, No. 49. Perfumery and Essent. Oil Rec., 1915, **6**, 8—9.

INSTEAD of determining the solubility of santal oil in a definite quantity of alcohol, it is preferable to determine the temperature at which the solution of oil becomes turbid. With solutions of 1 part by weight of genuine santal oil in 4 parts and 5 parts by weight of 70% alcohol, this temperature was 24° C. and 18° C. respectively. Admixture of cedar, turpentine, and camphor oils raised the temperature at which the solution became turbid. —T. C.

Essential oil of Santolina Chamæcyparissus. L. Francesconi and Granata. Gaz. Chim. Ital., 1914, **44**, II., 150. Perfumery and Essent. Oil Rec., 1915, **6**, 24. (See also this J., 1911, 1332; 1912, 202.)

THE oil contains two optically inactive, isomeric ketones, α- and β-santolinenone, which can each be separated into two antipodal forms by means of camphorsulphonic acid, and a lævorotatory γ-ketone giving an oxime, γ-santolineoneoxime, $C_{10}H_{17}ON$, forming large rounded prisms, m. pt. 116° C., $[\alpha]_D = +41°$, m. pt. of hydrochloride, 148°—151° C. None of these ketones combines readily with either sodium bisulphite or hydrazine or yields crystalline products with phenylhydrazine or bromine.—T. C.

Oils of digger pine, lodgepole pine, and red fir; The leaf and twig oils of ——. *Oils of the Coniferæ. IV.* A. W. Schorger. J. Ind. Eng. Chem., 1915, **7**, 24—26.

THE oil from the digger pine, *P. Sabiniana*, Dougl. (yield 0·078—0·102%) had the sp. gr. 0·8517—0·8566 at 15° C.; $\alpha_D^{20} = -20·93°$ to $-38·36°$; $n_D^{15} = 1·4670—1·4708$; acid value, 1·47—2·05; ester value, 6·77—11·98; after acetylation, 25·86—37·16. It contained: *l*-α-pinene, 58—59; *l*-limonene, 18; free alcohols (as *l*-borneol), 6; bornyl esters (as acetate), 3·5; *n*-heptane, 3; and "green oil" (b.pt. 265°—290° C.), 2—3%. The small quantity of heptane probably originated from the twigs: the oils from the oleoresins of the digger pine and the Jeffrey pine (*P. Jeffreyi*) consist almost exclusively of *n*-heptane. The oil from the lodgepole pine, *P. contorta*, Loud. (yield 0·234%) had the sp. gr. 0·8690 at 15° C.; $\alpha_D^{20} = -17·84°$; $n_D^{15} = 1·4831$; acid value, 0·90; ester value, 6·02; after acetylation, 32·30. It contained: *l*-β-pinene, 49—50; *l*-phellandrene plus dipentene, 19; cadinene, 7; free alcohols (as *l*-borneol), 7·5; *l*-camphene, 5—6; *l*-α-pinene, 3; and bornyl esters (as acetate), 2%. The fractions boiling at 205°—235° C. from the digger pine and lodgepole pine oils, when saponified and oxidised, yielded anisic acid, derived probably from methylchavicol. The oil from the red fir, *Abies magnifica*, Murr. (yield 0·154%) had the sp. gr. 0·8665 at 15° C.; $\alpha_D^{20} = -16·70°$; $n_D^{15} = 1·4861$; acid value, 0·75; ester value, 9·93; after acetylation, 36·22. It contained: *l*-phellandrene, 52; *l*-β-pinene, 16—18;

"green oil" (b.pt. 255°—260° C.), 13; free alcohols (as *l*-borneol), 7·5; and bornyl esters (as acetate), 3·5%. The lodgepole pine and red fir oils contained traces of furfural.—A. S.

Cholesterol into coprosterol; Conversion of ——. A. Windaus. Chem.-Zeit., 1914, 38, 1040.

WHEN cholesterol is reduced in the presence of finely-divided nickel, a mixture is obtained consisting of two isomeric dihydroxycholesterols and two isomeric coprosterols; from these, coprosterol may be separated by means of the saponin reaction. Platinum or palladium cannot be used as the catalyst in place of nickel.—W. P. S.

Alcohol for use in manufacture of ether, chloroform and chloral in Australia. Board of Trade J., Feb. 4, 1915.

AN Australian Commonwealth Customs Order (No. 1760), dated 27th November, 1914, lays down certain regulations for denaturing spirits for use in certain manufactures in the Commonwealth. Spirits for the manufacture of anæsthetic ether, chloroform, chloral, and chloral hydrate may be cleared without payment of duty, subject to denaturation to the satisfaction of the Collector of Customs. The following methods of denaturation may be permitted in the case of:—(1) Spirits for the manufacture of ether: (*a*) By the admixture of 10 gallons of ordinary ether with 100 gallons of rectified spirit; and in the case of alcohol charged into the still along with sulphuric acid: (*b*) By admixture of at least 50 parts of concentrated sulphuric acid with the rectified spirit used in the charge. (2) Spirits for the manufacture of chloroform, chloral, and chloral hydrate may be denatured by the addition of 0·05% of bone oil, which must conform to a certain prescribed standard. The following alternative method for denaturating spirits for the manufacture of chloroform may be permitted: 50 oz. of chloroform to be added to each 100 gallons of spirit together with the addition of a few pounds of calcium hypochlorite required for the process of manufacture. The denaturation must be performed under the supervision of an officer.

Perfumery and cosmetics. Board of Trade Bulletin.

THE values of the exports of perfumery and cosmetics from Germany in 1912 were as follows:—Perfumed greases, ointments, pomades, oils (fatty, animal), £98,900; eau-de-Cologne, £163,550; other perfumes and cosmetics, extracts and toilet waters, all containing ether or alcohol; toilet vinegar, £176,500; head, mouth and tooth wash containing ether or alcohol, £66,400; perfumed waters, not containing ether or alcohol; perfumed toilet powders, toilet paints, tooth powder, and other perfumery and cosmetics, not otherwise mentioned, £115,550; total £620,900; from Austria-Hungary (1913): vinegar, fats and oils, perfumed, in packages, £225; alcoholic aromatic essences, £2450; articles of perfumery (and all substances or mixtures which by their wrappers, labels, directions for use, etc., purport to be articles of perfumery), cosmetics (*a*) not containing alcohol (rouge, perfumed face-powder, hair-oil, pomades, tooth paste, fumigating pastilles), £41,900; (*b*) containing alcohol, £25,200; total, £69,775; from the United Kingdom (1913): perfumery, containing spirits (not made in bond), £168,400; perfumery, other sorts, £204,150; total, £372,550.

Of the German exports in 1912 the United Kingdom took £72,200 worth, including eau-de-Cologne to the value of £52,250. The other important markets supplied with perfumery, etc., by Germany and the amount taken by each were, Dutch East Indies (£45,200); British West Africa (£41,450); Netherlands (£41,300); Russia (£39,800); Australia (£32,050); Italy (£24,500); Argentine (£19,500); British India (£19,400); Belgium (£14,900); Turkey (£14,100); Switzerland (£12,000); and Mexico (£11,550). The total export trade of Germany in perfumery, etc., with British Possessions, in 1912, amounted to £127,750.

The Austro-Hungarian export trade in perfumery, etc., is a small one, amounting to less than £70,000 in the aggregate. Her principal markets in 1913 and the amount sent to each were: British India (£13,565); Russia (£7745); Roumania (£7450); Turkey (£4390); France (£4020); and Italy (£4310).

There are several important markets now thrown open to British manufacturers of perfumery and cosmetics, the principal being the Dutch East Indies, Netherlands, Russia, Italy, Turkey, Switzerland, Belgium, Mexico. There is also room for considerable expansion of the present trade with British South and West Africa, Australia, France, Roumania, Brazil, Argentina, and the United States.

Precipitation of serum albumin and globulin by alkaloidal reagents. Hanzlik. *See* XIXA.

PATENTS.

Methyl chloride; Manufacture of ——. B. S. Lacy, Perth Amboy, N.J., U.S.A. Eng. Pat. 16,194, July 7, 1914. Under Int. Conv., July 7, 1913.

SEE U.S. Pat. 1,111,842 of 1914; this J., 1914, 1075. The reaction is carried out at about 400° C.

Lecithin; Process for obtaining preparations containing free ——. H. Martin. Fr. Pat. 470,527, April 4, 1914. Under Int. Conv., April 8, 1913.

EGG yolk is mixed with alcohol (96%) and heated for ½ hr. at 80° C.; the alcohol is distilled off and the residue mixed with powdered sugar and a little flavouring material, compressed into tablets, and rapidly dried. A small quantity of alcohol may be left in the material until it is formed into tablets.—J. H. J.

Aluminium acetate; Manufacture of compounds of —— soluble in water, even after evaporation. Kalle und Co. Akt.-Ges. Ger. Pat. 277,149, May 23, 1913. Addition to Ger. Pat. 272,516.

AN aqueous solution of formaldehyde and ammonia may be used instead of the solid hexamethylenetetramine specified in the chief patent (this J., 1914, 568).—A. S.

Vaccine; Preparation of a ——. W. Fornet, Halensee-Berlin, Germany. U.S. Pat. 1,122,379, Dec. 29, 1914. Date of appl., Aug. 4, 1913.

SEE Ger. Pat. 264,300 of 1912; this J., 1913, 1087.

Nicotine; Process of preparing ——. W. Halle, Budapest, Austria-Hungary. U.S. Pat. 1,123,522, Jan. 5, 1915. Date of appl., May 29, 1913.

SEE Ger. Pat. 268,453 of 1913; this J., 1914, 221.

Esters of tertiary alcohols; Production of ——. P. Neumann and J. Zeltner, Charlottenburg, Germany. U.S. Pat. 1,123,572, Jan. 5, 1915. Date of appl., Nov. 6, 1913.

SEE Fr. Pat. 466,804 of 1913; this J., 1914, 845.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

PATENTS.

Photographs in natural colours; Production of ——. F. J. Norman, F. Willmot, T. F. Dawe, and W. Buchanan-Taylor, Westminster. Eng. Pat. 21,778, Sept. 26, 1913.

To produce cinematograph or other films in natural colours, three negatives are taken through red, green, and blue screens respectively, and transparent positives are prepared from them. The positive from the red-screen negative is toned blue with a chromium salt, ferricyanide, or cobalt chloride, and fixed; it is then coated with a gelatin emulsion sensitised with potassium bichromate, dried, and exposed under the positive from the green-screen negative, in register, washed in running water, stained with an appropriate red dye, fixed with tannic acid, and dried. The process is repeated, the freshly-coated film being next exposed under the positive from the blue-screen negative, and the film afterwards stained with a suitable yellow dye, and fixed. Or the yellow may be added to the film by preparing a separate gelatin film by exposure under the positive from the blue-screen negative, staining it with a suitable yellow dye, and placing it, while still wet, in contact with the red-dyed surface of the final colour film, allowing the latter to absorb the yellow dye.—E. W. L.

Colour photography. G. S. Whitfield, Watford. Eng. Pat. 24,566, Oct. 29, 1913.

In making a picture on a support such as paper which is expanded by water, correct registration of the finished result is obtained by keeping the support fully expanded with water during all the processes, including exposure and binding up with the viewing screen (see also Eng. Pat. 5144 of 1912; this J., 1913, 541).—B. V. S.

Colour photography. J. H. Christensen, Holte, Denmark. Eng. Pat. 13,260, May 29, 1914. Addition to Eng. Pat. 25,419 of 1913 (this J., 1914, 1226).

A coloured positive is produced from a coloured negative (*e.g.*, an autochrome plate before reversal) by exposing through the negative and a specially prepared film containing developer, on to a sensitive film which is coated on a coloured film; the developer film and sensitive film are in contact. The printing light is filtered to the colour of one of the elements of the negative, and the colour of the back film is complementary to this; one exposure is required for each coloured element of the negative. During the exposure the sensitive film is developed and the colouring matter is transferred through the developed film to the developer film; the developer film, or a specially prepared part of it, constitutes finally the coloured positive. If a separate negative is used for each colour, registration is necessary for the second and subsequent exposures; otherwise the negative and developer film are kept bound together. Fast Green Extra Bluish (Bayer), Fast Acid Fuchsin G and Pinatype Yellow (Höchst) are mentioned as suitable dyes, and methods of hardening the films and mordanting the dyes are suggested.—B. V. S.

Colour photography. F. E. Ives, Woodcliffe on Hudson, N.J. U.S. Pat. 1,122,935, Dec. 29, 1914. Date of appl., Aug. 5, 1912.

See Fr. Pat. 461,078 of 1913; this J., 1914, 44.

XXII.—EXPLOSIVES; MATCHES.

Precautions in the industrial preparation of nitro-compounds [*in Germany*]. *See* III.

PATENTS.

Nitrocellulose rich in nitrogen and easily stabilised; Preparation of ——. A. Voigt. Fr. Pat. 470,743, April 10, 1914.

The nitrocellulose is freed from the nitrating acid, and chopped up in a cutting machine, such as a forage or meat chopper, a paper cutter, or a planing machine, instead of or in conjunction with the usual treatment in beating engines.—J. F. B.

Trinitrotoluene; Preparation of pure —— from the crude product. Oberschlesische A.-G. für Fabrikation von Lignose, Schiesswollfabrik für Armee und Marine. Ger. Pat. 277,325, Aug. 29, 1913.

Crude trinitrotoluene is recrystallised from *o*-nitrotoluene. The same apparatus as is now used for recrystallisation from alcohol can be employed, and with the same working costs from four to five times as much of the crude trinitrotoluene can be purified by means of *o*-nitrotoluene, in a shorter time, and with a higher yield of the pure substance. The lower nitro-derivatives present as impurities accumulate in the *o*-nitrotoluene, which is afterwards used as raw material for the preparation of a further quantity of crude trinitrotoluene.—A. S.

Percussion-caps; Manufacture of compositions for ——. Rheinisch-Westfälische Sprengstoff A.-G. Ger. Pat. 277,566, Feb. 15, 1913.

Nitrogen sulphide is used in conjunction with oxidising agents, such as lead peroxide, barium nitrate, lead nitrate, potassium permanganate, etc., and the usual components of cap compositions. The gases produced on detonation are harmless and do not attack the rifling of the barrels.—A. S

Explosives; Manufacture of ——. Ver. Köln-Rottweiler Pulverfabriken. Ger. Pat. 277,594, Aug. 23, 1913.

Hexanitroethane is used alone or mixed with other substances. It cannot be exploded alone by percussion or friction, but requires a detonator. It can be used to improve the ballistic properties of nitrocellulose and nitroglycerin powders.—A. S.

Explosive and process of making the same. W. J. Hoynes. Fr. Pat. 470,209, March 28, 1914.

See Eng. Pat. 6755 of 1914; this J., 1914, 1227.

Explosive. S. Adde. Fr. Pat. 470,592, April 7, 1914.

See Eng. Pat. 13,373 of 1911; this J., 1913, 453.

Explosives; Gelatinised ——. A. E. Vergé. Fr. Pat. 470,765, June 23, 1913.

See Eng. Pat. 17,025 of 1913; this J., 1914, 943.

XXIII.—ANALYTICAL PROCESSES.

Arsenic; Detection of —— [*in animal organs, urine, etc.*]. O. Billeter. Chem.-Zeit., 1914, **38**, 981—982.

From 20 to 50 grms. of the substance is oxidised by sulphuric and nitric acids in the usual way and the resulting solution, freed from nitric acid, is diluted to contain about 80% H_2SO_4, and introduced through a tap-funnel into a distillation

flask containing 4 grms. of sodium chloride, 1 grm. of potassium bromide, and 0·2 grm. of hydrazine sulphate. The gases evolved are passed through a condenser and collected in a receiver containing a small quantity of hypochlorous acid solution, the contents of the flask being finally warmed while a current of air is drawn through the apparatus. The distillate is then treated with an excess of hypochlorous acid, evaporated to dryness, the residue dissolved in dilute sulphuric acid, and the solution transferred to the Marsh apparatus. In the case of urine, 200 c.c. is neutralised with sodium hydroxide, evaporated to dryness, the residue is mixed with 2 grms. of potassium perchlorate and 5 grms. of potassium sulphate, and the mixture transferred in small quantities at a time to a heated platinum crucible. The fused mass is then distilled with sulphuric acid, 0·8 grm. of potassium bromide, and 0·4 grm. of hydrazine sulphate, as described above.—W. P. S.

Arsenic; Electrolytic separation of zinc, copper, and iron from ——. A. K. Balls and C. C. McDonnell. J. Ind. Eng. Chem., 1915, **7**, 26—29.

Zinc, copper, and iron, and small quantities of lead may be separated electrolytically from arsenic in alkaline solution, provided the arsenic be in the quinquevalent form and a sufficient excess of alkali be used, *e.g.*, 10—20 grms. per 100 c.c. of electrolyte. Potassium hydroxide is preferable to sodium hydroxide, and in the case of copper and iron, tartaric acid is added to prevent the formation of a precipitate in the alkaline solution. The quality of the deposited zinc is improved by addition of a small quantity of glycerin, or a mixture of glycerin and alcohol, to the electrolyte. The current must be kept below 1·7 ampères per 100 sq. cm. when depositing iron, to prevent contamination of the deposit by carbon; preferably a current below 1 ampère per 100 sq. cm. is used. Deposition of iron oxide can be prevented by addition of a few c.c. of alcohol. To obtain good deposits of copper the anode must be rotated at 1000—1600 revolutions per minute and about 2 grms. of potassium nitrate added to the electrolyte (100 c.c.).—A. S.

Alkalimetric solutions; Standardisation of ——. F. D. Dodge. J. Ind. Eng. Chem., 1915, **7**, 29—30.

The use of the acid phthalate of potassium, $KHC_8H_4O_4$, for standardising alkali solutions for volumetric analysis, is recommended. It is prepared by half-neutralising a solution of phthalic anhydride and purified by recrystallising from water. It crystallises in the anhydrous form in hexagonal plates, is stable and non-hygroscopic, and is soluble in 10—11 parts of water at the ordinary temperature and in about 400 parts of alcohol. The corresponding sodium salt crystallises in transparent prisms with ½ mol. H_2O, which is lost on heating at 100°—110° C., the crystals becoming opaque.—A. S.

Nitrogen; The Folin-Farmer method for the colorimetric determination of ——. J. C. Bock and S. R. Benedict. J. Biol. Chem., 1915, **20**, 47—59.

To determine nitrogen in small quantities of material, it is converted into ammonia as in the Kjeldahl method, and the ammonia carried by a current of air into an acid solution and determined colorimetrically by Nessler's reagent in a Duboscq colorimeter (Folin and Farmer, J. Biol. Chem., 1912, **11**, 493). The authors point out several sources of error in the method; the accuracy of the colorimeter and of the measurement of the quantity of material taken for the analysis is limited to about 1% of the nitrogen present, the reagents employed are seldom free from ammonia, and ammonia may be absorbed from the atmosphere during the operations. Analyses of some 70 samples of urine by the method gave results usually agreeing within 3% with those found by the Kjeldahl method, but sometimes the difference may amount to from —11·8 to +4% of the quantity of nitrogen present. When the ammonia is removed by distillation without a current of air, the error amounts to about 5% of the quantity of total nitrogen. The Folin-Farmer method may be employed with advantage in cases where the quantity of nitrogen is very small (as in the determination of the non-protein nitrogen of blood), *i.e.*, where a large percentage error is not of great importance.—W. P. S.

Sugar in small quantities of blood; Determination of ——. R. C. Lewis and S. R. Benedict. J. Biol. Chem., 1915, **20**, 61—72.

The method depends on the red coloration produced when a dextrose solution is heated with picric acid and sodium carbonate, and due probably to picramic acid. Two c.c. of blood is mixed with 5 c.c. of water and 15 c.c. of saturated picric acid solution, diluted with water to 25 c.c., mixed, and filtered. Eight c.c. of the filtrate is treated with 2 c.c. of picric acid solution and 1 c.c. of 10% sodium carbonate solution, boiled until precipitation commences, 3 c.c. of water is then added and the boiling continued until the precipitate dissolves, whereupon the solution is cooled, diluted to 10 c.c., and filtered. The coloration obtained is compared at once with that obtained in a similar manner with 0·64 grm. of dextrose, 5 c.c. of picric acid solution, and 1 c.c. of 10% sodium carbonate solution. A standard solution, prepared by boiling together 0·064 grm. of picramic acid and 0·1 grm. of sodium carbonate in 50 c.c. of water and diluting the mixture to 1 litre, may also be used for the comparison. The method is accurate within 2% of the quantity of sugar present. The normal sugar content of blood was found to vary from 0·09 to 0·11%.—W. P. S.

Lead acetate test for hydrogen sulphide in gas. McBride and Edwards. *See* IIa.

Determination of sulphur in motor spirits. Bradbury and Owen. *See* IIa.

Determination of the percentage of toluene in commercial toluol. Colman. *See* III.

Determination of the specific gravity of tars, [tar] oils and pitches. Weiss. *See* III.

Reduction of ferric sulphate in acid solution by means of cadmium amalgam for titration of iron and free sulphuric acid. Capps and Boeis. *See* VII.

Analytical examination of commercial tungsten. Arnold. *See* X.

Determination of carbon and phosphorus in cerium and cerium alloys. Arnold. *See* X.

Pharmacopœia test for sesame oil in olive oil. Sage. *See* XII.

Detection of kapok oil. Besson. *See* XII.

Proposed uniformity in methods of fat analysis [for the leather industry]. Fahrion. *See* XII.

Determination of pentoses in tanning materials. Van Gijn and van der Waerden, and Reed and Schubert. *See* XV.

Determination of tanning materials [mangrove] in admixture. Small. *See* XV.

Analysis of sulphite-cellulose extracts. Paessler. *See* XV.

Detection of sulphite-cellulose in tanning extracts and in leather. Appelius and Schmidt. *See* XV.

Analysis of chrome leather and of materials used in its manufacture. Balderston. *See* XV.

Determination of free sulphuric acid in leather. Paessler. *See* XV.

Comparison of a few methods for total phosphoric acid in superphosphate. Peters and Weigel. *See* XVI.

Comparison of the Gunning-Cooper method and the Kjeldahl-Gunning-Arnold method for the determination of nitrogen. Jensen. *See* XVI.

Determination of dry substance in [beet] sugar factory products. Fallada. *See* XVII.

The volumetric Fehling method [for the determination of reducing sugars], using a new indicator. Breckler. *See* XVII.

Determination of pentoses and methylpentoses in wine. Schaffer. *See* XVIII.

Detection of goat's milk in cow's milk. Pritzker. *See* XIXA.

New method for the determination of unsaponifiable matter, applicable to ether extracts, fats, oils, and waxes. Rather. *See* XIXB.

Trade Report.

France. Prohibited exports. Board of Trade J., Feb. 11, 1915.

A FRENCH Presidential Decree, dated the 4th February, prohibits, as from the 5th, the exportation and re-exportation of the undermentioned articles:—Lactic acid; catechu, crude (*en masse*); celluloid, crude, in lumps, and plates, sheets, rods, tubes, sticks, scrap, waste; codeine; calcium cyanamide; digitalin; emetin and emetic; extracts of quinine; fulminate of mercury; graphite; residual oils from the distillation of alcohol; vegetable oils and whale oils; volvic stone (volvic lava); molasses; ores of molybdenum, titanium, vanadium; morphine; oleomargarine and similar substances; paraffin; sodium peroxide; phosphorus; pine and fir resin; beetroot saline; salol; ammoniacal salts; copper sulphate and "*verdets*"; "*bouillies*" and cupreous powders; terpine; infusorial earths; trioxymethylene. (See also this J., 1915, 104.) Exemptions from these prohibitions may, however, be accorded, under conditions to be laid down by the Ministry of Finance.

Switzerland. Prohibited exports. Board of Trade J., Feb. 11, 1915.

A DECISION of the Swiss Political Department, dated the 28th January, provides that, as from the 1st February, the prohibition of exportation established by the Decree of the 18th September, 1914, in respect of *medicaments* and *disinfectants* shall be held to apply to the following articles:—Acetanilide (antifebrine); acetone; acetylsalicylic acid; citric acid; salicylic acid and salicylate of soda; tartaric acid; adrenaline, natural or artificial, and other extracts of the suprarenal glands (suprarenine, paranephrine, epinephrine, etc.); agar; aloes; aluminium acetotartrate; antipyrine; apomorphine; arecoline and its salts; atropine and its salts; balsam of Peru, natural or artificial; bismuth and its salts; bromine and its salts; caffeine and its salts; chloroform for narcosis; cocaine and its salts and combinations; codeine and its salts; collodion; cresol and soapy solutions thereof; diethylmalonyl urea and its salts, veronal; dimethylaminoantipyrine, pyramidone; dionine; sulphuric ether, pure or unrefined; formalin liquid; glycerin, pure; heroine; castor oil; iodine and its salts; iodoform; ipecacuanha root; lanoline (wool grease); mastic; mercury and its salts; morphine and its salts; naphthalene; novocain; opium and powders of opium, extracts, tinctures; paraffin, solid or liquid; paraformaldehyde; permanganate of potash; phenacetin; phenol (carbolic acid), pure; paprika; quinine hydrochlorate and sulphate; cinchona bark; rhubarb root; salol; saltpetre; salvarsan, neosalvarsan; santonin; scopolamine (hyoscine); ergot of rye; semen contra; sulphate of copper; tannin; theobromine and its salts and combinations; tropacocaine and its combinations; vaseline. Medicaments and disinfectants other than those specified above are allowed to be exported until further notice.

Books Received.

PROPOSED NEW CUSTOMS AND EXCISE TARIFFS OF THE COMMONWEALTH OF AUSTRALIA. Suppl. to the Board of Trade J., Jan. 21, 1915. Price 3d.

STANDARD METHODS OF GAS TESTING. Circular No. 48 of the U.S. Bureau of Standards. Aug. 1, 1914. Government Printing Office, Washington.

THIS circular covers 180 pages, and contains suggestions as to location and equipment of gas-testing laboratories, a description of some of the accepted forms of apparatus, directions for making the various tests, and recommendations as to the interpretation of experimental results. The methods of testing included are those which have been found satisfactory in the laboratories of the Bureau or by experienced gas testers elsewhere.

APPENDICES TO THE THIRTY-EIGHTH ANNUAL REPORT OF H.M. INSPECTORS OF EXPLOSIVES, 1913. Wyman and Sons, Fetter Lane, London, E.C. Price 3s. 6d.

THE contents of this volume include lists of explosives authorised to be manufactured or imported, and of principal explosives used at mines and quarries; lists of railways, canal companies, and harbours and docks for which by-laws have been made or where traffic in explosives is prohibited; copies of various circular letters sent out by the Home Office; reports of ignitions of fire-damp and coal-dust caused by permitted explosives and of certain accidents by fire or explosion; and reports of prosecutions and convictions during 1913 under the Explosives Acts or Railway By-laws.

MINES AND QUARRIES. GENERAL REPORT, WITH STATISTICS, FOR 1913, BY THE CHIEF INSPECTOR OF MINES. PART II.—LABOUR. [Cd. 7721.] Wyman and Sons, Fetter Lane, E.C. Price 1s. 4d.

THIS publication contains a general report and statistics relating to persons employed and

accidents at mines and quarries in the United Kingdom, and to the enforcement of the Mines and Quarries Acts.

MINES AND QUARRIES: GENERAL REPORT, WITH STATISTICS, FOR 1913, BY THE CHIEF INSPECTOR OF MINES. PART III.—OUTPUT. [Cd. 7741.] Wyman and Sons, Fetter Lane, E.C. Price 1s. 4d.

THIS return contains statistics of the quantity and value of various minerals raised in the United Kingdom. (See this J., 1915, 87.)

MINES AND QUARRIES: GENERAL REPORT AND STATISTICS FOR 1912. PART IV. COLONIAL AND FOREIGN STATISTICS. [Cd. 7732.] Wyman and Sons, Fetter Lane, E.C. Price 1s. 7d.

THIS part of the Report includes statistics relating to persons employed, output, and accidents at mines and quarries in the British Colonies and in foreign countries during 1912 (see this J., 1915, 141.)

BORAX AND BORACIC ACID IN LEATHER MANUFACTURE. Borax Consolidated, Ltd., 16, Eastcheap, London, E.C.

THIS small booklet (6¾ by 5 in.) covers 92 pages, in addition to an index. It deals with various phases of leather manufacture under the headings of soaking, deliming and leaching, chrome tanning, and currying, and contains a number of recipes and formulæ. Extensive quotations are made from Fleming's "Practical Tanning" and from Watt's "Leather Manufacture."

TABLES ANNUELLES DE CONSTANTES ET DONNÉES NUMÉRIQUES DE CHIMIE, DE PHYSIQUE ET DE TECHNOLOGIE. Vol. III. 1912. Gauthier-Villars et Cie., Paris; Akadem. Verlagsges. m. b. H., Leipzig; J. and A. Churchill, London; Univ. of Chicago Press, Chicago. 1914. Price 28s. net.

THIS volume is similar in general arrangement to Vols. I. and II. (this J., 1912, 562 and 1913, 714) and covers 595 pages, 11 by 9½ ins. It is published by a committee nominated by the Seventh International Congress of Applied Chemistry, the members of which are: Prof. M. Bodenstein (Hanover), Prof. G. Carrara (Milan), Prof. E. Cohen (Utrecht), Prof. W. C. McC. Lewis (London), Dr. C. Marie, General Secretary (Paris). Following the general table of contents, is an alphabetical list of technical materials with references to all data of technical interest contained in the various sections of the volume; and in certain chapters of a rather complex nature, special tables of contents are given. At the end of the volume are lists of errata relating to Vols. I., II., and III. respectively. It is noted in the introduction that the chapters on spectroscopy, radioactivity, electricity, magnetism and electrochemistry, metallurgy and engineering, mineralogy, and biology have also been published separately this year.

AMERICAN SOCIETY FOR TESTING MATERIALS, affiliated with the International Association for Testing Materials. Year-book, 1914, containing the standard specifications. Edited by the Secretary-Treasurer and published by the Society. Office of the Secretary-Treasurer, Univ. of Pennsylvania, Philadelphia, Pa., U.S.A. 1914. Price $5.

THIS volume, 9½ by 7 ins., covering 500 pages, contains all the standard specifications adopted by the Society in their latest revised form; also some tentative specifications; selected specifications from miscellaneous sources; regulations governing the form of specifications, standard methods of tests, etc.; and an alphabetical index. Abstracts of some of the specifications have been already published (see this J., 1914, 1208; 1915, 31, 32, 33, 38, 81). Copies of single specifications may be purchased at 25 cents each.

THE RUBBER INDUSTRY. Edited by J. TORREY, Ph.D., and A. STAINES MANDERS. The International Rubber and Allied Trades Exhibition Ltd., 75, Chancery Lane, London, W.C. 1914. Price 15s. 6d. net.

THIS volume (10⅛ by 7 ins.) contains 516 pages of subject matter comprising the official report of the Fourth International Rubber Congress held in London in 1914, together with the papers read, and the discussions thereon; also the principal papers read at the Rubber Congress, New York, 1912. As an introduction to the volume is given a historical and descriptive paper by D. Spence, accompanied by synoptic tables of all the known brands of rubber, showing their botanical and geographical origin, their loss on washing, and their resin extract. Abstracts of many of the papers in the volume will shortly appear in the Journal.

THE EXTRA PHARMACOPŒIA OF MARTINDALE AND WESTCOTT. Revised by W. HARRISON MARTINDALE, Ph.D., and W. WYNN WESTCOTT, M.B. Lond., D.P.H. Sixteenth Edition. In two vols. H. K. Lewis, 136, Gower Street, London, W.C. 1915. Price, Vol. I., 14s.; Vol. II., 7s. net.

THE work is similar in general arrangement to the preceding edition (see this J., 1912, 848). Vol. I. covers xl.+1113 and Vol. II., viii.+469 pages (6⅝ by 4¼ ins.). In Vol. I., following a series of tables of weights and measures, atomic weights, etc., is a section on "Materia medica, official and non official, alphabetically arranged," covering 795 pages; also a table showing the antiseptic powers of some chemicals and disinfectant preparations; a list of poisons and antidotes; and a general index and posological table. In the chapter on radium, the various units of radioactivity are defined and compared, and a revised list of radioactive substances is given. Vol. II. deals largely with analytical tests and methods, and includes sections on the effects of chemical constitution on physiological action of synthetic drugs; the approximate composition of some proprietary medicines; the antiseptic power of chemicals; the action of acids on the common metals and their oxides, and also an organic analysis chart, and glossaries of words and phrases in foreign prescriptions.

MUTER'S SHORT MANUAL OF ANALYTICAL CHEMISTRY. Edited by J. THOMAS, B.Sc. Tenth Edition. Baillière, Tindall, and Cox, 8, Henrietta Street, London, W.C. Price 6s.

THE tenth English edition of Muter's Manual does not differ in general character and scope from its predecessors; such changes as have been made are mainly those necessitated by alterations in the new British Pharmacopœia. The scope of the work may be gathered from the fact that it occupies 232 pages, and deals with qualitative and quantitative analysis, inorganic and organic. The first part of the volume describes the detection of metallic and acidic radicals, and alkaloids and certain other organic substances commonly used in medicine. Part 2 contains chapters on volumetric and gravimetric methods of quantitative analysis, ultimate organic analysis, special methods for water, air, food, drugs, urine, and urinary calculi, and the analysis of gases, polarisation, and spectrum analysis. The book is intended primarily for pharmaceutical students.